A strategic model of macro-economic and supply chain factors that influence the decision-making process of SA retailers when expanding their footprint in African countries

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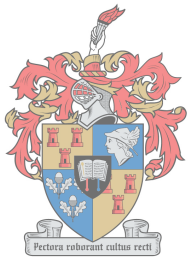

Thesis presented in fulfilment of the requirements
for the degree of Master of Engineering (Industrial Engineering) in the Faculty of Engineering at
Stellenbosch University

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March 2018

DECLARATION

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ABSTRACT

As part of the era of globalisation, the foreign market expansion of retailers is a trend that draws the attention of economists and researchers alike, and is an ever-expanding field of scholarly review. Africa is no exception to the process of globalisation, and as the local South African retail market becomes saturated with increasing levels of competition, large retailers are gradually experiencing more pressure to expand their footprint into other African countries. Foreign market expansion is a business decision that requires a structured analytical framework to assist in the decision-making efforts of potential foreign investors. Models can be synthesised to assess and prioritise which market, country, or region to enter next; what the opportunities and risk of such a move will be; and what the business case would look like in terms of cost and benefit. Only a limited amount of literature discusses this topic in the specific context of South African retailers, creating an opportunity for further research. This paper presents a strategic decision-support model to assist South African retailers in making well-informed decisions about which Sub-Saharan African market to enter next. A holistic approach is taken that covers various disciplines, including supply chain management, economics of development, and financial management.

Key words

Foreign market expansion, Emerging markets, Macro-economics, Retail, Supply chain strategy, Complex decision-making, Industrial engineering application, Model synthesis, Holistic systems thinking, Simplification, Mixed qualitative and quantitative approach, Analytical hierarchy process, Strategic profit model, Opportunity, risk, benefit, and cost

OPSOMMING

Die uitbreiding na buitelandse markte as deel van die globaliseringsera, is ʼn tendens wat die aandag van ekonome en navorsers trek en is ʼn studieveld waarop deskundiges toenemend fokus. Afrika is geen uitsondering in die globaliseringsproses nie, en soos die plaaslike Suid-Afrikaanse kleinhandel ʼn versadigingspunt in mededingingsvlakke bereik, word groot kleinhandelaars gedwing om hulle in ander Afrika-lande te vestig. Uitbreiding na buitelandse markte is ʼn besigheidsbesluit wat op ʼn analitiese raamwerk baseer moet word ten einde beleggers te help in hulle besluitnemingsproses. Modelle kan saamgestel word om vas te stel watter mark, land of streek vervolgens ʼn prioriteit behoort te wees vir besigheidsuitbreiding; watter geleenthede en risiko so ʼn skuif inhou; en wat die besigheidsplan ten opsigte van koste en voordele inhou. Daar is beperkte navorsing oor dié onderwerp in die Suid-Afrikaanse kleinhandelskonteks, wat ʼn gaping skep vir verdere navorsing. Hierdie tesis bied ʼn strategiese besluit-ondersteuningsmodel om Suid-Afrikaanse kleinhandelaars te help om ʼn ingeligte besluit te neem na watter Sub-Sahara Afrika mark hulle volgende moet uitbrei. ʼn Holistiese benadering word voorgehou wat verskeie dissiplines soos voorsieningskettingbestuur, ontwikkelingsekonomie en finansiële bestuur insluit.

ACKNOWLEDGEMENTS

"We are only creative because we are formed in the image of a Creator." – Unknown

I would like to thank my parents for their unfailing love and support, and my supervisor, Antonie van Rensburg, for his guidance throughout the process.

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CHAPTER ONE: INTRODUCTION

As the local South African retail market is becoming saturated with increasing levels of competition, large retailers are gradually experiencing more pressure to consider expansion into emerging African markets. As Marshall (2015) states in *Prisoners of geography (p137)*,

> There is a new scramble for Africa in this century, but this time it is two-pronged. There are well-publicised outside interests in the competition for resources, but there is also the 'scramble within', and South Africa intends to scramble fastest and furthest.

Retailers are investing in consulting expertise to help them answer questions about supply chain strategies, the variable and fixed costs involved in foreign market expansion[1], and its benefits (usually in the calculation of Return on Investment (ROI)). Retailers are also interested in what their competitors are doing (in other words, what the opportunity cost would be if they didn't also jump on the African bandwagon), while considering the risks involved in taking the leap.

From preliminary review of literature across the disciplines of supply chain management and economics of development, four main constructs became evident which give an indication of what is believed to be the best variables to plot against one another when making these expansion decisions from a supply chain strategy viewpoint. The four constructs are opportunity, risk, benefit, and cost (Gillis, Perkins, Roemer, Snodgrass & others, 2006; Levi, Kaminsky & Levi, 2003). Combining these four constructs into a single solution makes this is a complex problem to solve, as it stretches across multiple fields of study (supply chain management, financial management or 'engineering economics', economic development and marketing) and a single discipline view would not be satisfactory in finding the best investment opportunity. The fact that these main constructs consist of a mix of quantitative and qualitative variables adds to the complexity of the problem, and there is no simple way of modelling the phenomenon to get a single optimal answer.

The intention of this Master's thesis is to address the gap in academic research by developing a decision-support model which will take a holistic cross-disciplinary approach to guide retailers in their foreign market expansion efforts.

1.1 RESEARCH TOPIC DERIVED FROM PRELIMINARY READING

The research study is initiated by a preliminary review of current technical papers, which evolved into an in-depth literature review of journals in the fields of supply chain management, economics and business commerce on the four key constructs that are identified as being critical to foreign expansion decision-making in light of supply chain strategy (opportunity, risk, benefit, and cost). The preliminary reading started with an investigation on emerging markets in general and the opportunity that exists for retailers to expand

[1] A foreign market is an economic market in which the retailer does not have a business footprint yet.

into foreign markets. This led into a review of consumer products and the retail industry in Africa as well as the potential opportunities and risks that exist in retailers' expansion into emerging African markets. A preliminary study is conducted on the systems thinking approach in the context of complex decision-making and its application to supply chain management problems. Another topic that surfaced during preliminary research is the potential costs and benefits of expansion decisions (these are based on a strategic profit model derived from the field of engineering economics) and supply chain network strategy projects that provide the required inputs for the strategic profit model.

1.1.1 Preliminary reading on emerging markets

In order to understand the context of African countries as emerging markets (EM), the literature is reviewed to understand and identify core characteristics of such economies. According to literature studies done by Akbar, Bortoluzzi & Tracogna (2014), emerging economies reflect a certain level of volatility and market uncertainty. These markets are transitional in nature in terms of economics, politics and demographics, as they are moving from underdeveloped or developing to being developed[2]. The average income earned per person in emerging countries is lower than developed countries; an emerging market typically falls in the World Bank category of a middle-income economy with a GDP *per capita* between approx. 1,000 and 10,000 US (World Bank, 2016a).

Foreign investors find emerging markets attractive, as evidenced by the fact that emerging market economies account for more than half of current global foreign direct investment (FDI).

1.1.2 The impact that foreign investment has on emerging markets

Internationalisation does not only carry benefits for foreign investors, but also has a positive impact on the economies into which investors are expanding. A literature review compiled by Gbadamosi (2013) on African development in recent years enforces statements that African economies are on the rise, and economic growth has been positive since the 1980s. Multiple reasons have been identified for the growth spurt, including (but not limited to) a rise in total FDI, foreign aid, physical capital investment, innovation, and research and development.

With a specific focus on African countries, Gohou & Soumaré (2012) investigate the correlation between FDI *per capita* and the financial welfare of the population. The findings are positive, and it is clear that FDI inflows have a direct impact on economic stimulation and poverty reduction in African economies. The study is based on the Human Development Index (United Nations, 2016), which contains eight goals that the United Nations wanted to meet by the year 2015, with the intention to reduce poverty and improve human development. Foreign direct investment stimulates growth in the private sector, which is critical to a country's economic development. Gohou & Soumaré (2012) also confirm that real GDP *per capita* is on the

[2] The terms 'under-developed', 'developed' and 'developing' are indicative of a qualitative measure of the level of economic progress of a country. It refers to the well-being and quality of life of a population.

increase in most African economies, correlating positively with the population's welfare. According to Dupasquier & Osakwe (2006), historically low levels of FDI in African countries could be ascribed to factors such as social and political volatility, poor infrastructure, low standards of corporate governance, and slow economic growth. Dupasquier & Osakwe (2006) stress the importance of cross-border trade and the need for African countries to appeal to a higher number of foreign investors by creating more attractive opportunities and focusing on international relations.

There is no denying that foreign investment has a positive impact on the economic growth of emerging markets; and even though it is not the sole reason for a country's growth in GDP, there are considerable benefits for all partnering businesses and markets.

1.1.3 Emerging markets in Sub-Saharan Africa

Over the past decade, multiple publications and technical reports have been compiled on the increasing investment opportunities that Africa holds (ATKearney, 2015; Ernst & Young, 2015a; PwC, 2016a). Some believe it is a window period that needs to be exploited before it is too late, while others warn against Afro-positivism, pointing out that Africa still holds many threats and challenges to the investor (Ernst & Young, 2015a). There is no doubt that Africa has shown vast economic and social improvements since it was called the "hopeless continent" by the magazine Economist (2000). Macro-economic data shows that many African countries have experienced an improvement in factors such as GDP, labour productivity, further-spread democracy, infrastructure, foreign direct investment, and job creation, and a decline in foreign debt and inflation, over the past 10 years. Technical papers published by Ernst & Young (2013a) and PwC (2013a) agree that what makes Africa's steady growth even more remarkable is the resilience this emerging market has shown during global economic crises. Gbadamosi (2013) highlights that Africa is one of only two economies that had a steady growth in GDP during the 2009 global recession.

Combined with an increase in urbanisation and an expanding middle class, many African countries are now in a position to attract potential foreign investors, especially in the consumer products and retail sector, as stated by Ernst & Young (2014), ATKearney (2015) and PwC (2012a). According to a report by Ernst & Young (2013b), the return on investment (ROI) from investments in Africa has been among the highest globally since the 1990s. This report also states that, in the period of 2002-2012, the overall size of the African economy has trebled and its growth rate has doubled.

Even though many indicators point toward opportunities in Africa, the risk of expanding into these foreign markets cannot be ignored. Political instability and corruption remain some of the major issues preventing foreign investors from expanding into many African countries (Marshall, 2015). Some tools and resources have been developed by multinational corporations to assess the risks involved with business expansion into foreign markets, such as the International Country Risk Guide (PRS Group, 2017), Ease of Doing Business

ranking (World Bank, 2016b), Logistics Performance Index (World Bank, 2016c), and Mo Ibrahim Index of African Governance (Mo Ibrahim Foundation, 2016), to name a few.

The investigation of recent technical reports published by the 'big four' accounting firms (PwC, Ernst & Young, Deloitte, and KPMG) as referenced throughout the introduction of this thesis, is indicative that investment decision-making in the emerging African market is a very relevant and current issue. Further research of peer-reviewed articles is required to identify all quantitative and qualitative indicators that can be used to build models for assisting in the decision-making process about whether or not to enter a certain market. To address this real-world problem, a rigorous scientific research design approach is taken to build a decision-support model for South African retailers looking to expand their footprint into African countries.

The preliminary reading on Africa as an emerging market provides us with initial guidance on which variables should be considered during a foreign market expansion decision, specifically in terms of the opportunities available and the potential risks to consider (two of the four main constructs on which the research will be based, as explained in the introduction above).

1.1.4 Retail in Africa

Gereffi & Frederick (2010) encourage retailers to expand their business into new geographic markets, with a focus on emerging markets where individuals are experiencing an increase in disposable income. Internationalisation in the retail sector is receiving increased attention from scholars and researchers, and Gripsrud & Benito (2005) state that there is still much to be investigated with regard to retailers' foreign market selections.

Analysis of recent census data compiled by large multinational organisations such as the World Bank, the African Development Bank, and the United Nations indicates a growing middle class in many African countries. In a report on emerging markets by Ernst & Young (2013c), this data is used to estimate that the African middle class is expected to grow from 32 million in 2009 to 57 million by 2020, and to 107 million by 2030.

A growing middle class leads to a market with higher disposable income, creating an increasing demand for consumer and retail products. This is one of the many reasons foreign investors are scrambling to enter emerging markets in African countries. There is more to the investigation of a growth 'sweet spot' than merely looking at the trigger-threshold of the consumer growth rate. For economists, this 'sweet spot' occurs when the population starts transitioning from poverty into the middle class. 'Middle class' households are typically defined as those that spend more than 50 per cent of their disposable income on goods and services beyond basic food and necessities. The emergence of this 'consumer class' is driving growth on various levels. Alongside supportive demographic conditions, a growing middle class will stimulate demand growth, leading businesses to prosper, employment rates to rise, and economies to flourish. This growth is considered to be a virtuous cycle (Ernst & Young, 2013b).

In 2012, PwC reported in their 2012-2016 retail and consumer goods forecast that local South African retailers also view African countries as opportunities for expansion (PwC, 2012b). The drive behind SA retailers' expansion into emerging African markets can be ascribed to both reactive and proactive ('push' and 'pull') motives.

Increasing local competitive pressure and the saturation of shopping malls in South Africa lead to the lower availability of retail space, driving South African retailers and consumer goods firms to expand into Africa. Major South African retailers have already expanded their footprint into Sub-Saharan African countries, and most are now looking to invest even further north.

Urbanisation, the growth of middle-class consumer markets, and an increase in economic and political stability in various African countries are creating attractive economies for South African retailers to expand into. Research by Gripsrud & Benito (2005) shows that these cases illustrate the 'push' and 'pull' factors that lead to foreign market expansion in the retail sector: a market experiences a push into new markets when the home market is saturated, combined with a 'pull' into these markets due to these markets' economic attractiveness. In 2011, American retailer Walmart made waves in the African retail community with its R16.5bn acquisition of 51 per cent of Massmart (PwC, 2012c). By then Massmart already had a footprint in 12 African countries, and South African retailers are following suit. Even though international retailers are scrambling to gain a footprint in Africa, it is believed that South African retailers have a home-side advantage, given their experience in doing business in the volatile African market. Near-market experience is discussed in more detail in the literature review.

1.1.5 Decision-making and systems thinking

Assessing markets and making informed decisions about expanding into emerging markets is a complex exercise (Akbar *et al*., 2014), and there are many opportunities for further research on uncertainty during market entry (Ahsan & Musteen, 2011). Even though researchers have studied foreign market entry for years, Brouthers (2013) stresses that there is still a clear gap in investigating which tools would be most apt for the synthesis of rigorous models in assisting decision-making during internationalisation. Decisions should be based on quantifiable factors when modelling new market entry, in order to provide measurable outcomes. Brouthers (2013) also reiterates that a model should include all characteristics, factors or elements that will influence the decision-making process, while measuring these factors using generalised constructs so as to understand the entirety of the decision – but without focus being placed on only one or two elements.

In order to approach the question of market attractiveness in Africa, the problem must be broken down in a market hierarchy (global, regional, and national) to understand at which level investment decisions are being made. In order to make quantitative deductions about investment opportunities on a country or regional level, the macro-economic system of an African country can be viewed by taking a systems thinking approach. Comprehensive research is yet to be done on the application of a systems thinking approach for retailers

entering foreign economies (especially in context of the research scope of South African retailers looking to expand into Sub-Saharan African markets). Proposing a rigorous model synthesis approach could close this gap in the research.

According to Saaty (2008), subject matter expert knowledge is just as important as the data used during such a decision-making process, and this should also be taken into consideration during model synthesis. The aim of building a model is to accurately simulate a real-world phenomenon as closely as possible (Pruyt, 2013). Further investigation is required to determine all input and output variables that must be included in such a decision-support model.

1.1.6 The benefits and costs to consider during an investment decision

From basic engineering economics theory, it is evident that a decision on foreign market expansion cannot be based solely on the variables of market opportunity and risk involved in the expansion process: the potential monetary benefits and costs need also be quantified and taken into consideration. Levi *et al*. (2003) list all the costs to consider during supply chain strategic designs (such as handling costs, warehousing and inventory costs, and transportation logistics costs) which are useful in calculating the profit margin or return on investment (indicators of financial benefits for different scenarios of a decision).

1.2 RESEARCH PROBLEM AND RESEARCH QUESTIONS

1.2.1 Rationale of the research

With the rise of investment opportunities across Africa, there is a need for a structured analytical framework to assist in decision-making efforts by potential foreign investors, as highlighted by both Brouthers (2013) and Khanna & Palepu (2013). Models can be synthesised to assess and prioritise which market, country, or region to enter next; what the opportunities and risk of such a move will be; and what the business case would look like in terms of cost and benefit. According to a report by Ernst & Young (2014), decisions to enter African markets are currently based on ill-informed opinion, and not on empirical data or rigorous models. Few papers are found that discuss this issue in the specific context of South African retailers, creating a gap in the industry for further research and development of decision-support models to assist stakeholders in making well-informed decisions about which African market to enter.

1.2.2 Research objective and research questions

Derived from the preliminary reading, the research objective of this thesis can be summarised as follows:

> **The aim of this study is to construct a decision-support model for retail expansion in foreign markets, specific to South African retailers looking to enter Sub-Saharan African countries. The study identifies various industrial engineering tools and techniques, and all the qualitative and**

quantitative variables that should be considered during foreign market expansion. The identified tools and techniques are synthesised to present a strategic input-output model based on the four key constructs of opportunity, risk, benefit, and cost.

The research objective can be attained by finding answers to the following research questions in the context of opportunity, risk, benefit, and cost:

a) What quantitative variables need to be included in a strategic decision-support model?
b) What qualitative variables need to be included in a strategic decision-support model, and how are they to be converted into measurable variables?
c) What tools and techniques can be applied to include all the identified qualitative and quantitative variables in a single decision-support model?
d) Does the decision-support model represent the investment decision with a good level of confidence, given the opportunity, risk, benefit and cost involved?

1.2.3 Scope of model

In supply chain management, decisions can be made on a strategic, tactical, or operational level (further expanded on in Chapter 2.2.1). An important point to stress is the fact that the decision-support model will be designed on the strategic level only. Throughout model synthesis, the inputs and outputs of the model will be determined on a strategic level only, and all other tactical or operational variables will be considered as the detail that fall outside of its scope. This approach leads to a strategic design of a ring-fenced system – that is, synthesising a model in terms of its inputs and outputs without deep-diving into the knowledge of the internal workings of the system. This approach is helpful when one cannot measure the mathematical state of a system due to its complexity.

Excluded from the scope of study is the understanding of the cause and effect of macro-economic activity, the understanding of distribution network design mathematics (because it is part of the field of study of operations research), the collection and analysis of actual data points for the strategic profit model, and the effect of marketing and brand recognition on expansion into a foreign market. It is important to note that each of these exclusions contains an opportunity for further academic study and analysis, and should still be kept in mind when using the decision-support model proposed in this study.

1.2.4 Scope of countries selected for study

The scope of the study will focus only on Sub-Saharan African countries, assuming that the retailer is based in South Africa as the host country. Sub-Saharan African countries (as defined by the United Nations) include all the countries from the geopolitical regions defined as Eastern, Western, and Middle Africa. Countries that fall under the geopolitical region of Northern Africa are thus excluded from the scope of the study. Furthermore, Southern African countries (Botswana, Lesotho, Namibia, and Swaziland – also known as the ‘BLNS’ region) are also excluded from data collection and analysis, as it will be assumed that the

South African retailers under consideration in this thesis already have a footprint in each one of the BLNS countries.

It is also decided to exclude Sudan from the secondary data collection, as very few variables have reliable data points for this country, which could skew the results of the data analysis (United Nations, 2017).

1.3 RESEARCH DESIGN AND METHODOLOGY

1.3.1 Ethical clearance

Ethical clearance has been granted to the researcher, with risk assigned as 'low risk' by the University of Stellenbosch Departmental Ethics Screening Committee (DESC). The DESC describes 'low risk' research as involving a discomfort or inconvenience to the participant; but the investigation is on an uncontroversial topic. Only adults are interviewed, which is not viewed as a vulnerable research population. Data collected is non-sensitive, and the interviews concern opinion rather than personal knowledge. Generally, information is collected anonymously.

1.3.2 Engineering (or scientific) method

According to Montgomery & Runger (2010), engineers use the engineering (or scientific) method to solve problems of interest to society by efficiently applying scientific principles. The same practical approach is used in this thesis to address the research problem.

Figure 1-1 is a summary of the engineering method, and its correlation to the final structure of this thesis.

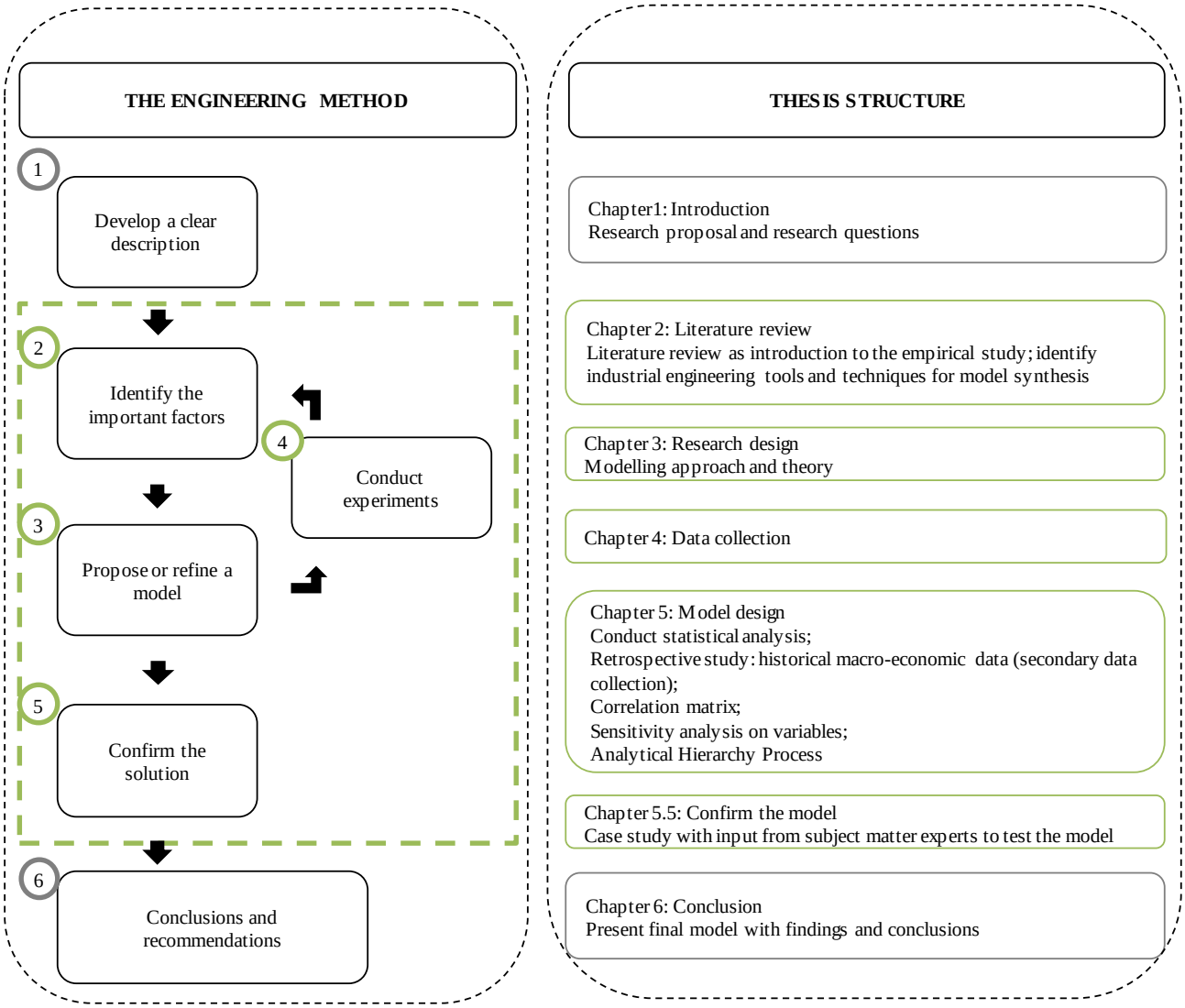

Figure 1-1: The engineering method and its correlation to the thesis structure

The introduction to the thesis develops a clear description of the research problem. The research is initiated by completing a thorough literature review where a combination of tools, techniques and variables are identified through studying literature on a wide range of key constructs. A research design is proposed to address the research problem, and using multiple variables as inputs, a strategic input-output model is proposed as a decision-support solution. To address the complex research problem, systems thinking is applied, and a hybrid of qualitative and quantitative methodologies is used. The proposed model is refined and validated to confirm the solution. Lastly, conclusions and recommendations are presented.

The application of systems thinking, which is a construct borrowed from systems theory (Wolstenholme, 1999), will ensure that a holistic approach is taken across various fields of study, as is required for the complex problem addressed. A rigorous industrial engineering approach is taken during model development, by following steps outlined in a typical scientific method. A model design that is ring-fenced in an intentional manner ensures that modelling remains on a strategic level, all the while keeping within the time and resource constraints of a Master's thesis.

1.4 OUTLINE OF THESIS

The thesis is structured around a literature review, research methodology, data collection, model design and final conclusions. Chapter 2 will provide a theoretical review of literature in the field of study. Chapter 3 expands on the research design and theory, based on the scientific method discussed above. Chapter 4 discusses the collection and description of all data required for the study. Chapter 5 is a representation of the final proposed decision-support model that addresses the research problem, and the final chapter concludes with a discussion of the findings of the study, its significance, its contribution toward academic research, and recommendations for future research.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION TO LITERATURE REVIEW

Decision-making in the context of foreign market entry is a growing field of research, particularly in publications which have a focus on emerging markets, highlighting the potential that these developing countries hold for foreign investors as the middle consumer class is growing. The goal of this chapter is to provide a thorough scholarship review of relevant literature on this topic.

2.1.1 Literature analysis methodology

A systemic and iterative approach is taken during the literature analysis. The search is initiated with a broad scholarship review and the literature selection is gradually refined with the aim of addressing the research questions posed in Chapter 1. For the task of synthesising and summarising a broad spectrum of topics, a combination of conceptual review and traditional review techniques is used during the literature study (Mouton, 2001).

The first section of the literature analysis (Chapter 2.2) focuses on a review of papers that have been published on the research topic to gain insight into approaches used in the past as support during decision-making efforts, specifically in the context of foreign market entry. This review will also identify gaps in the published research to be addressed by this thesis. Journals are considered from databases in the fields of supply chain management, economics of development, and business management. The four research questions posed in Chapter 1 are deconstructed into a selection of key words, phrases and synonyms that are used to search for articles across the identified databases. The search terminology used during this first iteration of literature review includes phrases such as “strategic investment decision-making”, “tools and techniques to model market expansion”, and “foreign market entry in emerging markets”. These phrases are well representative of the key constructs of the research, as well as the specific scope and context of the research problem.

In the second section of the literature review (Chapter 2.3), the database search is refined further by using the key words, phrases and synonyms identified. This section of the literature review identifies all the potential factors that should be considered when a retailer makes decisions on foreign market entry (specifically in the context of a South African apparel retailer deciding which African market to expand its business into). Search phrases used during this iteration include “macro-economic variables to be considered during foreign market entry”, “risks and challenges of market entry in the retail industry”, “opportunities for increasing competitiveness in the consumer goods market”, and “factors that impact the distance to market”.

The results from the first iteration of literature review provides definitions for the key research constructs in Chapter 2.1.2, which serves as an introduction to the literature findings in Chapters 2.2 and 2.3.

2.1.2 Key constructs defined

From the research aim and preliminary reading in Chapter 1.1, a selection of constructs are identified that are integral to the research, and each of the constructs are defined in this chapter before proceeding to the rest of the literature review. Note that the order in which the constructs are listed correlates with the sequence of Chapter 2.2 in which each construct will be expanded on.

2.1.2.1 Supply chain strategy

Frazelle (2002) and Levi *et al*. (2003) agree that a supply chain is a complex system, and it is challenging to design and operate a supply chain while keeping system-wide elements in mind. Supply chain strategy is the approach of taking strategic steps to align supply chain operations with the goals of the company, such as growing market share and increasing profit.

2.1.2.2 Global supply chain network

A physical supply chain consists of multiple nodes of suppliers, warehouses, distribution centres, and retail outlets, as well as the transportation logistic solution that connect each of these nodes (Levi *et al*., 2003). A supply chain approach gives a company a holistic view, with the ultimate goal that all partners throughout the chain will contribute toward the best possible value per unit distributed (Coyle, Gibson, Langley & Novack, 2013). Three types of flow form part of a supply chain: units of product, information, and financials; and in a global supply chain, these flows cross national boundaries.

2.1.2.3 Engineering economics for complex decision-making

Engineering economics is the study and analysis of economic problems faced by engineers, specifically in light of making complex investment decisions. Kossiakoff, Sweet, Seymour & Biemer (2011) explain that simple decision-making takes some elementary information and intuition, but complex problems require multiple inputs and a deeper level of research, and typically give a greater number of outputs. Data gathered must be carefully investigated and synthesised such that the complex problem can be presented to stakeholders in a simplified way so that they can make a well-informed decision.

2.1.2.4 Economic growth and development

Economic growth is an indicator of the general health or status of a country, and can be deduced from observing the rate with which gross net income (GNI) *per capita* is rising, as well as general improvements in the basic health, education, and welfare of its citizens (Gillis *et al*., 2006).

2.1.2.5 Foreign market entry

Dupasquier & Osakwe (2006) stress that African countries should focus on creating more attractive opportunities for foreign investors to enter a country and stimulate its economy. Foreign market entry is the efforts of a business to expand its footprint beyond the host country, into a foreign market with which it has not had trade relations in the past.

2.1.2.6 Systems thinking

A system is a complex whole consisting of various parts; and its working depends on the interaction among the parts. Systems concepts originate from Greek philosophy and have been refined in various disciplines, such as the development of systems principles, systems thinking and systems dynamics by Forrester (1994). The term 'systems thinking' was made popular by the publication of the book The Fifth Discipline by Peter Senge (Senge, 1997). The theory of systems thinking presents a holistic approach to complex issues, as opposed to the theory of reductionism, which looks at the parts in isolation (Jackson, 2003).

2.1.2.7 Uncertainty in decision-making

The decision of foreign market expansion is a complex one and contains a high level of uncertainty in its variables. Ahsan & Musteen (2011) claim that the issue of uncertainty has been one of the most prominent topics in the research field of foreign market entry, and they define it as the lack of information about the likelihood of an outcome, and the inability to determine which data is most relevant during decision-making. In the context of economic engineering, Newnan, Eschenbach & Lavelle (2004) further iterate that uncertainty in input data used for decision-making, is a major issue to take note of. In most cases, future costs, demand, and revenue will be uncertain, and as part of the data collection process, a range of likely values must be determined.

2.2 LITERATURE SECTION 1: KEY CONSTRUCTS AND RESEARCH CONTEXT

The first iteration of the literature review provides a compilation of academic findings on the research topic within the context of the study. An exploratory approach is taken where the findings of the study are organised and conveyed by key research constructs (or 'schools of thought') (Mouton, 2001). The expected outcomes from Section 1 of the literature review include a clear definition and understanding of each of the key constructs under investigation; a summary of the extent of research that other academics have completed on the research problem addressed in this thesis; a list of tools and techniques that would be most apt for addressing the research aim (constructing a decision-support model to guide stakeholders during foreign market expansion – specifically South African retailers looking to expand business into developing African markets) and a list of which quantitative variables should be taken into consideration during model synthesis.

Key constructs and search phrases used in the first iteration of literature review are listed in Table 2-1.

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Table 2-1: Key constructs and search phrases used during the first iteration of the literature review

LITERATURE SEARCH – ITERATION 1
KEY CONSTRUCTS strategy / decision-making / uncertainty/ tools, techniques, methods / investment / market expansion / diversification / distance to market / foreign market entry / internationalisation / cross-border / multinational CONTEXT / SCOPE OF STUDY developing / emerging markets / Africa / Sub-Saharan Africa / retail / apparel & clothing / consumer products / macro-economics / supply chain / engineering economic analysis

2.2.1 Supply chain strategy and globalisation

Mangiaracina, Song & Perego (2015) compiled a thorough literature review of distribution network design (DND) to identify the most important factors to consider during supply chain expansion. Their paper finds that many scholars have approached the research problems of DND, but that little research has been completed on building frameworks or holistic classifications of variable input factors that should be taken into consideration. Mangiaracina *et al*. (2015) concluded that there is a gap in the literature study of the qualitative variables that should be considered during DND, and the weighted importance of variables have not yet been thoroughly addressed in the literature.

Decision-making can occur on three levels of a supply chain: strategic, tactical, or operational. Levi *et al*. (2003) comprehensively discuss network design on a strategic level, and state that the focus of strategy is on infrastructure, with a planning horizon of a few years. Levi *et al*. (2003) also explain that, during strategic decision-making, the aggregation of products occurs on a family level, and the return on investment is expected to be higher than that for tactical or operational supply chain decisions. One of the first points Levi *et al*. highlight in *Designing and managing the supply chain* is that supply chain strategies must be aligned with the specific goals of the company, such as maximising market share or profit (Levi *et al*., 2003). Thompson, Eisenstein & Stratman (2007) conducted a study of supply chain managers and high-level executives' perception of business growth. From this study, executives are encouraged to adopt a broader mindset to grow market share profitably, rather than merely focusing on cost reduction. This is done through acquiring new customers and expanding into new markets.

When taking a DND approach to foreign market expansion of the supply chain, profitability can be determined by calculating the return on investment (Hyvönen & Tuominen, 2007). To get to this point, one needs to understand the elements making up a network design. Levi *et al*. (2003) define a network design as the decisions on the physical configuration of the supply chain – the number, locations, and size of distribution centres (DCs), as well as the assignment of vendors and stores to each of the DCs. Key sourcing decisions are made at this strategic level, and the typical planning horizon is a few years.

According to Levi *et al*. (2003), major inputs required to complete a network study include the current and future locations of all nodes (distribution centres, depots, customers and vendors), the current product groups and their unit demand, and throughput and transport modes, projected growth of unit throughput and future customer and vendor locations, transport rates (by mode, shipment size, and delivery frequency), and the expected supply chain costs (including fixed overheads, labour, inventory holding, and operating costs).

In the context of expansion across African markets, different scenarios can be simulated for the various countries selected for potential expansion, as long as estimates are available of future unit demand and transport rates for each scenario. Another important point to consider during a supply chain network strategy would be selecting the locations of retail outlets in each of the countries simulated. Levi *et al*. (2003) mention that this location decision needs to take into consideration the geographical and infrastructure conditions of the region, the natural resources and labour availability, the local industry and tax regulations and the projected market potential.

Once data collection is complete, the inputs are aggregated to a manageable size for simulation of the current baseline and future network scenarios. Products are grouped by type or unit cost, while customers and vendors are clustered by location proximity. In order to move ahead with the simulation of future scenarios, a baseline current state is simulated to validate inputs against company accounting information.

Supply chain network designs can be simulated using either one of two practices: mathematical optimisation techniques or simulation models (Geoffrion & Van Roy, 1979). The mathematical optimisation techniques include exact algorithms that find one optimal least-cost solution, or heuristics that find a number of good solutions. On the other hand, simulation models provide an approach to evaluate specific alternative scenarios selected by the designer. Geoffrion & Van Roy (1979) present a strong argument for the use of optimisation-based techniques; but ultimately, the sheer complexity of network design problems requires integer programming – which is significantly more difficult to solve. Decision-makers revert to the use of simulation that takes into account the dynamics of the system to evaluate scenarios. It is not within the scope of this study to go into more depth about the mathematics behind such simulation, as the study is ring-fenced only to identify and investigate inputs and outputs of a decision-making model on a strategic level.

The output of a supply chain network design should enable stakeholders to make well-informed decisions, as they are now able to calculate financial benefits with the knowledge about the capital investment required, the number of units distributed in the new market, distribution cost per unit, and other fixed and variable costs.

From a supply chain management perspective, the elements that must be considered during strategic decision-making are the organisational goals (such as profitability or other financial benefits), capital investment required as determined by a network design, unit throughput, various supply chain costs, and unit selling price.

2.2.2 Financial benefits to consider (engineering economics)

When a supply chain strategy project is undertaken, it impacts the income statement and balance sheet by adding various costs that impact the profit margin and affect the return on assets ratio. The fields of engineering economic analysis and financial management are investigated to identify inputs and outputs to be included in a decision-support model (in the specific context of a supply chain strategy).

Newnan *et al*. (2004) state that every complex issue can be broken into manageable components from which sensible solutions can be deduced, and well-informed financial decisions can be made with the correct tools. Economic analysis focuses on costs, revenues, and benefits of alternatives during decision-making. Coyle *et al*. (2013) explain the relationship between the supply chain and company finances in the text of *Managing supply chains: A logistics approach*. The text highlights that supply chain strategies that optimise the business's profitability take a systems approach in trading off revenue against costs for optimum profit. The main financial objective for the company, specific to foreign investments, will be a satisfactory return on investment for the stockholders. The absolute size of profit is considered in light of the stockholders' net investment (or net worth).

From the basics of a balance sheet and income statement, financial analysis can be done to determine the impact of various supply chain strategies or investment scenarios to improve overall profit (Coyle *et al*., 2013). Figure 2-1 shows how ratios are calculated to compare the financial impacts of alternative decisions.

VARIABLE	**SYMBOL**
Sales	S
Cost of Goods Sold	CGS
Gross Margin	GM = S - CGS
Transportation	TC
Warehousing	WC
Inventory carrying	IC = IN X W
Other operating cost	OOC
Total operating cost	TOC
Earnings before interest & tax	EBIT
Interest	INT
Taxes	TX
Net income	NI
ASSET DEPLOYMENT	
Inventory	IN
Accounts receivable	AR
Cash	CA
Fixed assets	FA
Total assets	TA
RATIO ANALYSIS	
Profit margin	NI / S
Return on assets	NI / TA
Inventory turns/year	CGS / IN
Transportation as % sales	TC / S
Warehousing as % sales	WC / S
Inventory carrying as % sales	IC / S

Figure 2-1: Financial ratios to use for holistic decision-making (Coyle *et al.* 2013)

Another tool that is helpful in making decisions on a strategic supply chain level is the strategic profit model (SPM), which shows the relationships between sales, costs, assets, and equity, as depicted in Figure 2-2. This model is used to trace the financial implications of alternatives to net income, return on assets, and return on equity (Coyle *et al*., 2013).

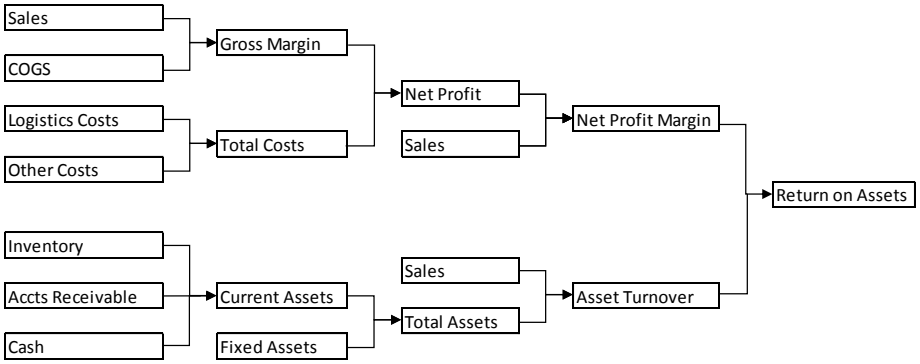

Figure 2-2: Strategic profit model (Coyle *et al*. 2013)

Calculated ratios such as profit margin and return on assets are valuable variables with which to measure the benefits of an investment. Newnan *et al*. (2004) mention, however, that most economic engineering decisions are usually based simply on maximising profit. The research study considers scenarios where neither the input value nor the output value is considered to be a fixed amount, and variables contain a high degree of uncertainty. In this case, to be as economically efficient as possible, the goal is to minimise cost and maximise return on investment (ROI). In this thesis, the profit margin and return on assets would be the main outputs from a strategic profit model that should be considered carefully when analysing an investment scenario.

2.2.3 Various costs to be considered as input variables

From the previous discussion on supply chain elements, it is clear that various costs need to be considered as inputs to a decision-making model. These supply chain costs are identified by Levi *et al*. (2003), and include the handling costs (such as labour and utility costs which are proportional to annual unit throughput), warehousing fixed costs (these costs are not proportional to annual unit throughput and are typically calculated by warehouse capacity), storage costs such as inventory holding (which is calculated based on average inventory totals) and the transportation logistics costs (the inbound costs are calculated as the import and inbound distribution costs from the source of supply to the in-country warehouse; the outbound costs pertain to the total supply chain cost incurred from the warehouse to the final customer).

When making long-term strategic decisions, most of the time these distribution and supply chain costs are unknown (or highly variable). The concept of estimation is the foundation of economic analysis (Newnan *et al*., 2004). Engineering economics analyse decisions that will impact the future state of a business. Due to this focus on the future, consequences are not known with certainty and must be estimated. Three types of

estimation are identified: rough estimates for high-level planning that tend to involve 'back-of-the-napkin' numbers with little detail, require minimum resources, and have an accuracy range of -30 to +60 per cent (asymmetry is due to the fact that decision-makers tend to underestimate the magnitude of costs); semi-detailed estimates that are used for budgeting purposes at a project's conceptual or preliminary design stages (this estimation requires more detail, more time, and more resources, with an accuracy of about -15 to +20 per cent); and detailed estimates used for the detailed design phase (this estimate involves the most resources, and has the highest accuracy of about -3 to + 5 per cent).

One way of simplifying cost estimation is the use of a 'per unit model' that uses a single factor, such as cost per square meter, to develop cost estimation. This is an especially useful technique for conducting high-level rough estimates.

Even though a financial cost and benefit analysis is critical to investment decisions, Coyle *et al*. (2013) highlight the fact that the conclusions from financial analysis do not consider the risk involved during investment, and are thus not sufficient as a stand-alone model during the decision-making process. Financial scenario analysis should rather be included in a model that gives a holistic view of the investment decisions under consideration, where risk and opportunity are also taken into account.

2.2.4 Foreign market entry, economic growth, and development

Mitra & Golder (2002) state that the subject of foreign expansion and market entry has been a hot topic of research, but many studies consider only a few elements of the decision-making process in isolation. Further study is required to approach the research problem holistically and strategically. Gereffi & Frederick (2010) encourage retailers to expand into emerging markets, as growth in the retail industry is certain when a market's disposable income increases. (Africa is a good example of an economy with a fast-paced growth rate.) This growth rate is of great importance, and emerging markets play a crucial role in the global economy. Retailers looking to expand into emerging foreign markets are faced with many complex decisions, such as which market to enter, when to enter it, and which mode to use. According to Gripsrud & Benito (2005) and Ahsan & Musteen (2011), this topic has been under the spotlight over the last few decades, and much research has been undertaken on the choice of foreign market and its entry mode. These articles also mention that the expansion of the retail sector is especially pronounced, but that few researchers have focused on retailers' decision-making efforts.

Doing business in Africa comes with many unique challenges. No two countries pose identical risks and opportunities, which means that foreign direct investments (FDIs) need to be approached creatively and with an attitude of adaptability and resilience. As listed by Anyanwu (2006) and discussed by Njawaya (2011), some of the reasons for high investment risks across the African continent include: corruption; poor air, road and port infrastructure; high volatility; small individual country size; unfavourable international image; and

poor governance. DeBerry-Spence, Dadzie, Darley & Blankson (2008) highlight that there are also many cultural challenges on a sub-market level when retailers promote a new brand in African countries.

In the book *Winning in emerging markets*, Khanna & Palepu (2013) outline five types of hurdles which they termed 'institutional voids'. These voids are typical attributes of emerging markets, and give good insight into the challenging conditions experienced by companies when entering this new playing field.

The potential institutional voids that are evident in emerging economies include the following (Khanna, Palepu & Sinha, 2005): Political and social instability in the market, inadequate protection of intellectual property, and a complex or ineffective legal system of the country or region; The difficulty of doing business in the market, corruption, and red tape hindering foreign investors from entering the playing field; The lack of intermediaries that specialise in market research, inadequate knowledge of market trends and consumer habits, and the inability to maintain a well-structured supply chain of vendors and distributors; The lack of high-quality human capital (labourers with the required skills or expertise), as well as restrictive labour laws and regulations in the country or region; A lack of financial intermediaries and investors, instability of stock markets, and any other potentially restrictive or supportive regulations in the capital market.

Anyanwu (2006) states that the risks of expansion into African markets must be addressed on global, national, regional, and sub-market levels. This thesis, however, also highlights a promising future for the investment climate in Africa, as improvements are starting to show in areas such as infrastructure and an increase in GDP; and it finds that overall investment risk across the continent is on the decline.

Many papers have already been published on new market entry modes (the channel or method to be used to enter a foreign market). According to Ahsan & Musteen (2011), these modes include forming joint ventures, exporting goods, and expansion via franchises or as wholly-owned subsidiaries, such as acquiring an existing business in the new market. Throughout research, it will be assumed that the choice of entry-mode has already been made, as the focus of this research is rather to identify all factors to take into account when deciding which country to enter (or whether or not to enter a new market at all). A firm's entry-mode decision could have a knock-on effect on another decision-making factor, but for the purpose of this research problem it will be assumed that the expansion approach is taken of the retailer entering as a wholly-owned subsidiary.

Anyanwu (2006) identified the impact of foreign investment in African countries as being positive and critical to economic growth. Foreign direct investment and cross-border trade stimulate a country's economic development, and are found to increase the gross national income (GNI) *per capita*, which serves as an indicator of the welfare of a country's population. Investors looking to enter new markets in Africa will thus not only seize the opportunity to expand their own footprint, but will also stimulate the economy of the foreign market, creating a cyclical effect in the long run.

2.2.5 Complex decision-making

The literature agrees that new-market entry could be a company's most important strategic decision (Mitra & Golder, 2002). Ahsan & Musteen (2011) compiled a comprehensive literature study of the importance of managing the risks of uncertainty during foreign market entry, and the competitive advantage a multinational company gains when it deals successfully with uncertainty. Uncertainty is addressed in the context of culture, politics, policies and legal conditions, markets and macro-economics, supply and demand, and exchange rate fluctuation – which in the past have all been addressed separately. It is clear that investors face higher levels of uncertainty in emerging markets than in developed countries, as these markets experience very different political, economic, and social challenges (Brouthers, 2013). Ahsan & Musteen (2011) also state, however, that uncertainty should not merely be regarded as a negative factor: it could also be seen as an opportunity that enables context-specific learning. With a willingness to be open-minded and teachable, multi-national enterprises (MNEs) could have learning benefits that will be advantageous to future expansion.

Levi *et al*. (2003) touch on the different decision-making tools available for strategic network design, and note that most decision support systems are a hybrid of various analytical techniques. Selecting the best decision-making tool to use depends at which hierarchical level the decision needs to be made, on the solution accuracy required, the problem complexity, the number of output variables, the timeframe, the capital available to make this decision, and the number of goals that the decision-maker seeks.

Rational decision-making is a complex process, with Figure 2-3 giving a possible flowchart for the process. Deciding which data to take into account further complicates the decision-making process, as data is not always readily or publicly available. Newnan *et al*. (2004) state that data can be collected by using different methods, such as gathering from sources that are publicly available (this approach to data collection is at no cost, with immediate availability of data points), collecting information from specific knowledgeable people or subject matter experts and assembling data through surveys. Figure 2-3 also summarises the research methodology (which is expanded in Chapter 3).

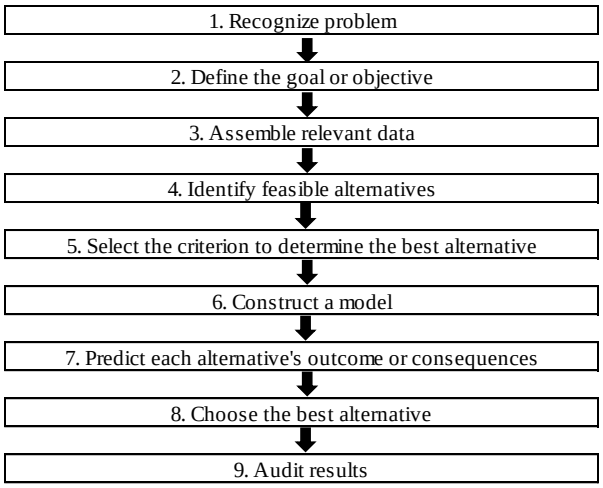

Figure 2-3: Steps to an engineering economy decision-making process

The first two steps, as outlined in Figure 2-3 by Newnan *et al*. (2004), have been expanded on in Chapter 1 of this thesis: recognising and defining the decision to be made. Data collection (completed in Chapter 3 of this thesis) is a compilation of publicly available sources, a literature study, and expert knowledge. The next step in identifying feasible alternatives will be the study of economic variables to select the best potential African markets for expansion. The criteria selected to determine the best alternative will include opportunities, risks, benefits, and costs, to be plotted against one another to give a holistic view of the decision. Model construction then merges each of the previous elements discussed in this paragraph. Modelling is a physical representation of the system under investigation. It may include mathematical equations and interrelationships with the goal of predicting outcomes for each feasible alternative. To simplify the final step of choosing the best alternative, it will be assumed that decision-making will be based on the relative attractiveness of the various alternatives.

The goal or objective of a decision-making process is usually stated in terms of financial benefit, in order to make alternatives comparable. Taking the potential opportunity and risk of each alternative into consideration adds to the complexity of the decision, but will assist in making a well-informed decision.

2.2.6 Systems thinking and model synthesis

In the past, it has been strongly suggested that rigorous, quantitative models be built to understand complex systems (Wolstenholme, 1999). Wolstenholme (1999) argues that the need for quantitative (more so than qualitative) analysis is relative, and depends on two factors: the audience being addressed, and the selected problem-solving methodology. He states that the best approach to modelling a complex phenomenon could be to blend quantitative and qualitative thinking, thus aiming to address a wide scope of research questions while maintaining scientific rigour.

Paulrajan (2014) explains that a tool increasingly used in decision-making processes is model synthesis with a systems thinking approach. Paulrajan (2014) uses Vensim ® PLE software (Ventana Systems, 2016), and argues that the simulation assists stakeholders to find an optimised solution for an array of scenarios that require analysis, and to see the results of decisions to be made.

The goal of modelling a complex phenomenon or issue in a closed system is to simulate the real-world as accurately as possible (Pruyt, 2013). The scope of the modelled system is of critical importance, and model synthesis is seen as an art as much as it is a science. Basing the research design purely on systems thinking might not be satisfactory in addressing the research problem. According to Wolstenholme (1999), no map or model is ever completely satisfactory in analysing complex systems, and further investigation will always be necessary. For this reason, the research will take a holistic approach that includes both quantitative and qualitative inputs, tools, and techniques.

Jackson (2003) explains the philosophical concept of systems thinking with the following quote:

> *An understanding of the whole, or the truth, could be approached through a systemic unfolding of thesis, antithesis and synthesis. Each movement through this cycle, with the synthesis becoming the new thesis, gradually enriched our grasp of the whole.*

Savage (2003) states that the purpose of analytical modelling is to reflect a real-world scenario, but with the advantage of experimenting with various parameters to gain useful insights during complex decision-making. Savage then lists the benefits of analytical modelling, mentioning that it mitigates the risk by enabling the simulation of various scenarios in a quantitative manner, and yields unexpected insights into real-world issues. The process of model synthesis compels the analyst to understand the relationships being modelled better, and to gain greater insight about the required data. Model synthesis is thus considered useful as a way to communicate – especially to convey relationships between variables visually. According to Liengme (2015), modelling in spreadsheets such as Microsoft Excel is still the most popular method of conducting data analysis as it is readily available, easy to learn, and has better features for handling large datasets than other symbolic mathematical software.

2.2.7 Analytical hierarchy process (AHP)

Saaty (2008) first introduced the analytical hierarchy process (AHP) as a useful approach to synthesising quantitative and qualitative variables for complex decision-making. The approach is based on multi-criteria decision-making, using the experiential knowledge of the stakeholders of the decision. The network structure proposed by Saaty (2008) is especially relevant to this research problem, as it is a useful approach to constructing decision outcomes based on the four main constructs of the research problem: opportunity, risk, benefit, and cost.

Complex decisions usually involve many qualitative variables that need to be weighed against one another, based on the objective of the stakeholders making the decision (Saaty, 2008). A useful technique is the analytical hierarchy process (AHP), where multiple criteria are pre-selected and defined in the context of the decision being made. AHP is one of the most widely used techniques for decision-making where multiple criteria are considered, as it successfully translates both qualitative and quantitative variables (Cebeci, 2009). AHP is a method of pair-wise comparison, where input from a team of subject matter experts is required to weigh each variable against the next using a simple ratio scale (Saaty, 2008). Vargas (1990) believes that the experiential knowledge of subject matter experts during decision-making is just as important as the data used to make the decision. Goepel (2013) also states that the AHP approach during multi-criteria decision-making is a useful tool to construct objective outputs by aggregating the inputs of multiple decision-makers. Goepel (2013) developed a spreadsheet template for AHP that is available for public use, with inputs based on questionnaires, and using the row geometric mean method (RGMM). The level of consistency required (alpha) is a required input to the model as a value between 0 and 1. Alpha is used to calculate a consistency ratio (CR) and geometric consistency index (GCI). The CR and GCI are used to validate the consistency of

model inputs to ensure that the model results are reliable and replicatable. The Eigenvector method is used to calculate the final outputs (weights assigned to each variable), and uses the power method algorithm with a fixed number of 12 iterations. The template Goepel (2013) developed allows for the practical aggregation of inputs from multiple users across multiple variables. Although any value for alpha may be selected by the research architect, Saaty (2008) suggests that only judgement matrices with a consistency ratio (CR) of less than 0.1 should be accepted. The AHP calculations are explained further in Chapter 5 (Model Design).

2.2.8 What-if analysis, sensitivity analysis, and Monte Carlo modelling

The responsibility of a decision-making model is not only to present good recommendations, but also to justify the recommendations convincingly (Geoffrion & Van Roy, 1979). It is not enough merely to argue that the research design and methodology is sufficient: the model must be verified with sound evidence of the sensitivity of the recommended alternatives to all inputs used. A comparative study must be done to compare model outcomes with different possible futures. What-if analysis is the process of experimenting with the model variables by keeping all but one input constant, and then analysing the deviation of outputs to understand the impact and relationships of the input variables better (Savage, 2003). Newnan *et al*. (2004) also mention that many data points used during decision-making are merely projections of future estimates, and that there is considerable uncertainty in the accuracy of the input variables. The extent to which an input variable affects the output of the model should be considered carefully. A variable is said to be ‘sensitive’ if it greatly impacts the output of the alternative selection. Break-even charts and what-if analysis are both ways of conducting a sensitivity analysis. The break-even analysis assumes that all variables are held constant, with changes being made to only one parameter at a time. What-if analysis, on the other hand, varies multiple input parameters to test model sensitivity. This is an iterative process to test the rigour of input parameters and confirm the final suggested model.

Where inputs cannot be gathered through primary data collection, random variables are simulated to test the proposed model design. Monte Carlo simulation is a helpful tool to synthesise data points under uncertainty (Savage, 2003) by using algorithms for repeated random sampling across a data set with a specified probability distribution. The essence behind Monte Carlo simulation is to create hundreds of possible outcomes of a variable, giving a narrower range than the traditional what-if scenario would, as the Monte Carlo method hardly ever samples from rare events (the lowest probability regions). As further expanded on by Jäckel (2002), the Monte Carlo technique has been refined to such an extent that it has become a very helpful and much-used tool for simulating realistic models under uncertainty.

2.2.9 Conclusion to Literature Section 1

Many of the criteria identified as important for consideration during foreign market entry decision-making, are listed across multiple fields of study, and it becomes clear that various disciplines overlap as the research

problem is addressed. This shows that the literature across various academic fields complements one another as the study progresses toward model synthesis.

According to the literature review, the application of systems thinking is vital for taking a holistic approach during the complex decision-making process. Furthermore, a list of tools and techniques are identified that would be most apt for the synthesis of a decision-support model for retailers looking to expand into foreign markets. These include model synthesis in Microsoft Excel, a rigorous literature study as part of the empirical research design (applied to data collection and statistical content analysis), the Analytical Hierarchy Process, supply chain distribution network design, Monte Carlo simulation, sensitivity analysis, what-if analysis, and the strategic profit model.

Literature confirms that a satisfactory input-output model can be synthesised by using Microsoft Excel, as is fitting within the scope, time, and resources available for the research. In answering the first research question, many quantitative variables are identified as being important for consideration during strategic supply chain decisions and should be included in the model. These quantitative inputs include: the total unit demand and sell price per unit (which equates to total sales); the cost of goods sold; total operating cost (including inbound and outbound transportation costs, and other operating costs); final gross margin as an indicator of profitability; and lastly, the return on assets or return on investment to quantify the final impact of the investment decision.

The emerging markets are seen a window-opportunity for expansion, and cross-border expansion should be considered as part of a retailer's strategy to increase market share and profitability. Little academic research has been compiled on the simulation of foreign market entry while taking a cross-industrial or holistic view, and there is an opportunity to close this gap in the research. Furthermore, a deeper level of research must be undertaken in order to obtain a holistic view of the qualitative variables (opportunity in the form of market attractiveness and risk of foreign market entry) that should be taken into consideration during model synthesis.

From the findings in literature section 1, additional key words and search phrases are now compiled to initiate the second iteration of the literature search. The key phrases identified are listed in Table 2-2.

Table 2-2: Key constructs and search phrases identified for second iteration of literature review

LITERATURE SEARCH ITERATION 1
KEY CONSTRUCTS
strategy / decision-making / uncertainty/ tools, techniques, methods /
investment / market expansion / diversification / distance to market /
foreign market entry / internationalisation / cross-border / multinational
CONTEXT / SCOPE OF STUDY
developing / emerging markets /
Africa / Sub-Saharan Africa /
retail / apparel & clothing / consumer products /
macro-economics / supply chain / engineering economic analysis
LITERATURE SEARCH ITERATION 2
economic variables / economic impact /
market attractiveness / potential / opportunity / advantage /
risk of market entry / restrictions / constraints / challenges /
qualitative / quantitative variables

2.3 LITERATURE SECTION 2: MACRO-ECONOMIC VARIABLES

The second section of the literature review addresses the research questions by investigating each qualitative variable identified in Literature Section 1, with the aim of compiling a comprehensive list of factors that influence stakeholders' decisions during foreign market entry. From the conclusion to Chapter 2.2, additional key concepts and literature topics are identified for this section of the literature study (Table 2-2), in order to give an overview of existing research and to provide a foundation for the data collection and model building to follow. This subsection of the literature study serves as introduction to the collection of empirical data (Chapter 4).

Part of the research aim is to compile a comprehensive and exhaustive list of variables that are well representative of the opportunities and risks that should be considered during a foreign investment decision. Data collection is initiated by conducting a thorough search across peer-reviewed publications and secondary data sources. Sites and indices that provide high-quality secondary data on regulatory and normative environments include the Global Competitiveness Index, the Economic and Investment Potential Index, the Customer Demand Potential Index, the African Retail Development Index, the Ibrahim Index of African Governance, the Economic Freedom Index, and the Euromoney Country Risk Survey (Brouthers, 2013). From the preliminary literature review, it becomes clear that there are many variables that could be taken into consideration when weighing the benefits and costs of a foreign direct investment. A discussion follows on each of the 'opportunity' and 'risk' variables, and a summary is provided in a single table in Chapter 4: Data collection.

Mitra & Golder (2002) explain that, even though the concept of foreign expansion and market entry has been a hot topic of research, many studies consider only one or two elements in the decision-making process. Consulting companies have published white papers in an attempt to combine a larger number of variables, in order to explain their most recent approaches in modelling quantitative and qualitative elements during such decisions for their own business, or those of their clients. It is clear that this decision-making process is a highly complex problem to solve – not only because of a large number of variables that need to be taken into consideration, but also because strategic decision-making needs to happen across various business silos. In further research on this topic, it becomes apparent that there is a gap in the research for the simultaneous study of the various factors that influence foreign investors when making foreign market entry decisions (Gripsrud & Benito, 2005).

Khanna *et al*. (2005) mention that neither composite indices (such as Ease of Doing Business, the Corruption Perceptions Index or governance indicators) nor market size and growth should be viewed in isolation from one another. Rather, a holistic approach should be taken during foreign market expansion decisions to consider the market opportunity and the potential risk of investment.

2.3.1 Opportunity variables

One of the four main constructs of the research problem in this thesis, is the opportunity that a foreign investment decision holds (hereafter referred to as 'opportunity'). Many qualitative macro-economic variables exist that could potentially be an indicator of the opportunity that a foreign market holds for a retail investor, and this section summarises a definition for each of these variables. The review for each 'opportunity' variable serves as an introduction to the empirical data collection, where a content analysis will be conducted to determine which of these variables are truly well representative of the 'opportunity' construct, and should be included in the decision-support model (Chapter 4: Data collection).

2.3.1.1 Economic attractiveness

Globalisation across the supply chain industry creates pockets of opportunity for retailers to invest in foreign markets. Dornier, Ernst, Fender & Kouvelis (2008) and Coyle *et al*. (2013) agree that there is a constant drive toward global supply chains. Foreign retailers create competing pressure, and foreign customers create new opportunities, as much of the demand growth available to companies lies in foreign emerging markets. Global cost forces are also considered to be a potential driver, as low labour costs could add to the attractiveness of a foreign market. Political and economic forces also have a tangible impact on the drive toward globalisation. Development of regional trade agreements and greater democratic freedom may stimulate investment in a foreign country, while tariffs, quotas, and political instability may hinder this expansion.

In an era of globalisation, investment decisions are made on a macro-economic level. According to the literature review compiled by Mitra & Golder (2002), the factor that is considered first and foremost when

entering a foreign market is the economic attractiveness of the country. Ghemawat (2001) states that a firm is 10 times more likely to do business with a country with which it already has economic ties (such as a country that was formerly colonised by the firm's host country), that a common currency between two countries increases their willingness to trade by 340 per cent, and that common membership of a regional trading bloc increases countries' trade by 330 per cent. The retail industry is especially affected by economic distance – more so than other industries, for various reasons such as the nature of retail demand varying with income level, the importance of economies of standardisation and scale, the labour and other cost differences being salient, and companies' need to be responsive and agile (for example, with clothing and home appliances).

Many elements contribute to a healthy economy; and from the literature review, the following economic factors are identified as needing to be taken into consideration.

GDP and GDP growth: A country's economic size is generally measured by its gross domestic product (GDP) – the monetary value of a country's finished goods and services within a certain timeframe. All other factors being equal, foreign investors are most likely to measure market attractiveness solely on variables that indicate an increase in the economic health of a market (Mitra & Golder, 2002). According to Mitra & Golder (2002), markets with prosperous consumers are more likely to buy retail goods, and can afford goods priced higher than countries with a lower level of prosperity. Generally, it can also be assumed that larger economies can lead to higher sales of goods (more units sold) and to economies of scale that are beneficial to the profit margin of a company. According to Welsh, Alon & Falbe (2006), GDP growth is a good measure of a market's economic growth, and is also directly correlated with defining a market as 'emerging'. Macro-economic uncertainty is the standard deviation in variables such as economic activity and prices as measured over time (Ahsan & Musteen, 2011). Volatility in economic factors will discourage foreign investors from negotiating contracts in a new market.

Population growth: The increase in a country's population size could equate to an increase in attractive market size. Specifically, a growing middle class leads to a market with higher disposable income, creating an increasing demand for consumer and retail products. A greater number of potential consumers would increase the perceived market attractiveness for foreign investors. According to Gillis *et al*. (2006), economic development leads to population growth, and can be directly correlated, while an accelerated population growth in turn leads to a change in demographic dividend (the age structure of a population). A country with an attractive demographic dividend is one whose age distribution is such that the majority of the individuals are independent and able to earn an income.

FDI inflow: The inflow of foreign direct investment (FDI) to a country is a good indicator of the amount of confidence other multinational enterprises (MNEs) are placing in the given market; and there is a direct correlation between FDI and economic growth in Sub-Saharan countries (Njoupouognigni & others, 2010). If retail competitors find a country attractive for expansion, it could be beneficial to follow suit.

Competitiveness: The competitiveness score is an indicator of a country's economic success (Hyvönen & Tuominen, 2007) and is a measure of how productively a country uses its resources (human, capital, and natural) (Porter, 2003). The Global Competitiveness report can be used to compare the productivity and prosperity of various countries' economies against one another. The index is compiled from more than 100 variables, two-thirds of which come from the Executive Opinion Survey and the remaining third from secondary data sources such as the United Nations. The index is divided into 12 main categories, including institutions, infrastructure, macro-economic framework, health, primary education, and higher education and training. GCI scores competitiveness on a scale of 1 to 7.

2.3.1.2 Size of target market

Foreign direct investors in the retail industry are market-seeking and demand-oriented, making market size one of the most important variables to take into consideration when making investment decisions (Dunning, 2000), before progressing to more in-depth market analysis where more factors are taken into consideration (Gripsrud & Benito, 2005). This is especially true in third-world countries, where retail stores generally have a much smaller footprint, and a large volume of sales is required to offset these lower economies of scale. Based on a firm's definition of a target market, the size of the target customer market can be quantified for a selected country by using publicly available databases. From a supply chain operations perspective, market size will impact delivery schedules, volumes, order fulfilment, and other areas (Coyle *et al*., 2013).

Income level (GDP *per capita*): GDP *per capita* is a good measure of economic prosperity, as it reflects the wealth of the country's individuals, the size of specific market brackets, and levels of development (Welsh *et al*., 2006). GDP *per capita* is thus one of the main variables considered by foreign investors, as an economy with financially prosperous individuals could be considered more attractive for investment. When considering the economic size of a potential market, it is important to translate variables such as GDP *per capita* into a relative measure known as 'purchasing power parity' (PPP) to give a more realistic reflection of the variable (Welsh *et al*., 2006).

Studies by Mitra & Golder (2002) also found that firms should be more successful in a country that has a similar GDP to their host country (also known as having a small economic distance), as it is likely that it would have a similar target market or consumer base that will buy similar products. Firms would also have the advantage of having greater economic knowledge of markets similar to their own. According to Ghemawat (2001), basic economic measures such as wealth and size (GDP) are still important variables to consider during global expansion, as a 1 per cent increase in either of those variables could lead to an increase in trade of up to 0.8 per cent. By 2011, the African Development Bank (AfDB) had estimated Africa's middle class at approximately 350 million (over 30 per cent of the total population). The report defined the middle class as those with a daily consumption of $2-$20. A growing demand for consumer goods is the result of a growing middle class; and that is a key driver for retailers to enter foreign markets (Gripsrud & Benito, 2005).

Urbanisation and population density: Urbanisation leads to an increase in population density, which in turn leads to a larger market of easily-accessible consumers. During the early stages of internationalisation, the size of the foreign market's consumer base (especially in a high concentration) makes a market more attractive to foreign investors (Gripsrud & Benito, 2005). Accessibility to customers does not only mean a decreased geographic distance to reach the target market, but also a higher impact in the spread of marketing material. A more condensed distribution radius also contributes to lower distribution costs throughout the supply chain (Mitra & Golder, 2002).

Distribution by age: The demographic dividend, also known as the 'dependency ratio' in a country, is a variable that quantifies the proportion of children and elderly people in a population (Gillis *et al*., 2006). A higher dependency rate would mean that the working population will have fewer financial resources to save and spend, effectively decreasing the market size and available labour cohort. Economic growth potential increases when the share of the working-age population (15 to 64) is larger than the non-working-age share of the population (14 and younger, and 65 and older).

2.3.1.3 Marketing and brand recognition

Consumer involvement, brand recognition, and brand loyalty: The level of consumer involvement in a market could influence a foreign investor's decision about whether or not to enter that market. Consumer involvement can be either low or high, with the levels of involvement depending on a combination of the consumer's background (culture, demographics, lifestyle), the physical characteristics of the product, and the situation surrounding the purchase (Gbadamosi, 2013). In an environment with low levels of involvement, a consumer shows indifference toward the product, brand, marketing, and promotional efforts while purchasing and consuming the product. High levels of involvement are characterised by consumers who base their decisions on brand, advertising, and promotional efforts, and who believe that careful decision-making is important when buying. Gbadamosi (2013) completed a rigorous review of the literature on consumer involvement and brand recognition in an African context. Brand research in this context that was completed before that literature study had lacked robustness, given African countries' varying and unique cultures, which are quite different from those of more 'developed' countries. The study also concluded that consumer behaviour cannot be studied without taking cultural context into consideration.

For a multinational retailer entering a new market, marketing questions include whether the entry company has to adjust its brand to fit into the specific cultural context, and how important brand loyalty is in the local market. If brand loyalty has low importance for a certain consumer market, it would be easier for a foreign investor to bring its own brand into the market without incurring the costs of doing intensive market research and altering the brand. According to Gbadamosi (2013), the brand attitude of Africans is greatly influenced by values and motives, demographics, and other cultural aspects such as tribe loyalty. A brand would thus be perceived differently in the various African countries and cultures.

Market variables such as consumer involvement and brand loyalty can only be estimated by in-depth market research, and data for this variable is not readily available via secondary sources.

2.3.2 Risk variables

Even though globalisation leads to a larger number of potential markets than can be tapped into for increased sales and profits, the risks involved in this expansion cannot be ignored. Levi *et al*. (2003) characterise global supply chain risks in Figure 2-4 below. Risks such as epidemics, geopolitical issues and natural disasters are considered to be 'unknown-unknown' since these are highly unpredictable in nature. Risks that can be quantified and predicted more accurately are defined as 'known-unknown' risks, and include issues such as supplier performance, forecasting accuracy and execution problems.

Figure 2-4: Risk sources and characteristics (Levi *et al*., 2003)

It is evident that risk management strategies must be in place for companies to be competitive in international markets and to realise payback from foreign investment opportunities (Coyle *et al*., 2013).

Placing focus on the potential risk of foreign market expansion, Bremmer (2005) notes that there are many important variables apart from economic growth to take into consideration. These include governance (rule of law and levels of corruption), social factors (such as access to basic services and levels of health and education), as well as national security, economic freedom, and trade relationships.

2.3.2.1 Labour climate

The labour climate is determined by factors such as the cost and availability of labour, the workforce's degree of education and literacy, unionisation, skill levels, work ethic, and productivity (Coyle *et al*., 2013). Khanna *et al*. (2005) list some labour-related questions to consider when investing in a foreign market, but the answers to them are difficult to quantify. These include whether the local culture would accept foreign managers, how the rights of workers are protected, and whether trade unions defend workers' interests or only advance a political agenda. However, some secondary data is available that could help to quantify the current state of labour climate in a country.

The annual cohort of new labour entrants: Population growth and age distribution point to the available size of the labour force in a country over the next few years. The participation rate measures the active proportion of a country's workforce, as it refers to the number of individuals who are either currently employed or actively seeking work. Data on the annual cohort of new labour entrants and the participation rate per country is available from the website of the African Economic Outlook (African Economic Outlook, 2017). Factors that impact the availability of a local labour market include the level of skills upgrading required, current working conditions, unionisation, and wages (Bair & Gereffi, 2001). The high unemployment rate in regions of Africa is a driver of lower labour cost, as relatively low hourly wages are sufficient to attract the required workforce (Sternquist, 1997). Data for individual wages by country is available from the Trading Economics website. Berger (2005) argues, however, that cheap labour is not necessarily a driver of competitiveness. According to research conducted by MIT across more than 500 companies, this is not one of the variables considered to be important during strategic decision-making.

Literacy of workforce: According to Khanna *et al*. (2005), the quality of the labour market depends on whether the country has a strong elementary and secondary education, and on whether English is the main language for doing business. Data on the estimated adult literacy rate for each African country is collected and made available by the African Economic Outlook annually.

Access to basic services: Quality of life is difficult to quantify, but can be understood by considering factors such as access to basic services (sanitation, education, healthcare, housing cost, passenger transportation, telecommunication, connectivity, etc.). Quality of life affects the well-being of the workforce and the quality of work delivered (Coyle *et al*., 2013). Data that could assist in quantifying a country's access to services is available from sources like the African Economic Outlook and Euromonitor, and includes the following elements: water supply coverage (%), sanitation coverage (%), electricity consumption, and internet users per 100 inhabitants.

Cultural distance: Cultural distance is defined as the extent to which the foreign market country's language, beliefs, management practices, and values differ from a firm's host country. Wood, Barone, Murphy & Wardlow (2012) and Mitra & Golder (2002) emphasise the role this plays while doing business in a global market, as major differences could lead to miscommunication, conflict, and decreased effectiveness. Cultural distance could increase the cost of entering a market, reduce operational efficiency, and hinder the MNE from maximising their core competencies in the given market (Jackson & Deeg, 2008). There are thousands of languages across the continent of Africa, and no single culture has emerged to dominate large regions, as is the case in Europe, Russia, China, or the USA. Marshall (2015) explains how this hinders communication and discourages interaction across large trade regions. Cultural uncertainty in a foreign market could also lead to uncertainty in market research into the potential demand, profit, and risk (Ahsan & Musteen, 2011). Cultural distance is seen as a 'soft' or qualitative variable that is very hard to quantify. For this reason, the variable should be excluded from further analysis.

2.3.2.2 Political and social climate

The regulative and normative climate of a market is influenced by the possibility of nationalisation, unfavourable government action, or social changes that could negatively impact a business. Jackson & Deeg (2008) list political transparency, anti-trust regulations, intellectual property protection, judicial system efficiency, fiscal policy, inflation, and market dominance as key indicators of a market's regulatory environment. Normative indicators include political and economic resilience, the extent of corruption, the government's take on economics, transparency toward citizens, political risk, independence of local authorities, and bureaucratic issues.

According to the research of Ghemawat (2001), government involvement is high in industries such as farming, aerospace, electricity, telecommunications, mining, and infrastructure, but lower in the retail industry. This section of variables will thus not carry as much weight during the model design as would the variables of economic attractiveness, labour climate, market size, or ease of doing business, all of which have a greater influence on the retail industry, which is the focus of this research.

Khanna *et al*. (2005) list questions that should be asked to gain insight into a country's social and political climate. The answers should give an insight into whether the government goes beyond regulating business to interfering in it or running companies, and whether the laws articulate and protect private property rights. The quality of the country's bureaucrats needs to be determined by examining the bureaucrats' incentives and career trajectories. Other questions posed by Khanna *et al*. investigate whether the judiciary of the country is independent, whether the courts adjudicate disputes and enforce contracts in a timely and impartial manner, and how effective the quasi-judicial regulatory institutions are that set and enforce rules for business activities. It should also be determined whether non-governmental organisations, civil rights groups, and environmental groups are active in the country, and the extent to which the people tolerate corruption in business and government.

In *Prisoners of geography*, Marshall (2015) outlines the damage caused by colonialisation, when different European powers invaded, occupied, and divided up much of Africa, reconfiguring the contours of countries as they desired. To this day, these forced changes to the continent's political geography are largely the cause of ethnic conflicts and political unrest in Sudan, Somalia, Kenya, Angola, the Democratic Republic of the Congo (DRC), Nigeria, Mali, and elsewhere.

Multiple indices have been developed that are good indicators of the social and political welfare of a country, including the Corruption Perceptions Index (CPI), the International Country Risk Guide (ICRG), the Economic Freedom Index, the Political Freedom Index, and the Ibrahim Index of African Governance (IIAG).

Corruption: The Corruption Perceptions Index (Transparency International, 2016) reports on the perceptions of the level of corruption as seen by economic analysts, businessmen, and experts in the various countries. Perceptions are measured on a scale of 1 to 10 (10 being clean). According to Gillis *et al*. (2006),

there is a strong correlation between economic growth and the extent of corruption prevalent in a country. Corruption levels are indicative of the risk of doing business in that market, and investors with a low risk tolerance might find that the perceived risk outweighs the investment opportunity.

Economic freedom: The Economic Freedom Index (Heritage Foundation, 2017) measures the impact of liberty and free markets around the world, and defines economic freedom as the fundamental right of every human to control his or her own labour and property. It is believed that economic freedom leads to economic prosperity in a country. In a market with a high rating of perceived economic freedom, individuals are allowed to work, produce, consume, and invest freely as they please, and governments allow labour, capital, and goods to move freely without coercion.

The index is based on twelve quantitative and qualitative factors, derived from four concepts:

i. Rule of law (property rights, government integrity, judicial effectiveness)
ii. Government size (government spending, tax burden, fiscal health)
iii. Regulatory efficiency (business freedom, labour freedom, monetary freedom)
iv. Open markets (trade freedom, investment freedom, financial freedom)

Each of the twelve economic freedoms within these categories is graded on a scale of 0 to 100.

Political freedom: The Political Freedom Index (Freedom House, 2017) considers the electoral process, political participation, the functioning of the government, freedom of expression and of belief, associational and organisational rights, the rule of law, and personal autonomy and individual rights. Each of the variables is awarded a score on a scale of 0 to 4, which in turn is converted into ratings for political rights and civil liberties. A country considered to be politically free enjoys political rights, including fair elections that take place regularly; the ruling party has strong political parties competing with it; and minority groups are well represented (Khanna *et al*., 2005). Furthermore, the roles of the legislative, executive, and judiciary should be clearly defined. Civil liberties ensure freedom of expression, with religious, linguistic, regional, and ethnic groups coexisting peacefully, and allow for vibrant and independent media. A fair legal system ensures the rule of law, which grants equal opportunities to all citizens.

Corporate governance: According to Kaufmann & Kraay (2008), research clearly shows that good governance is critical for the economic development of a country. They define good governance as a capable state being accountable to its citizens and functioning under the rule of law. The Mo Ibrahim Foundation defines governance as "the provision of the political, social and economic goods that any citizen has the right to expect from his or her state, and that any state has the responsibility to deliver to its citizens". The Ibrahim Index of African Governance (IIAG) (Mo Ibrahim Foundation, 2016) mainly considers safety and the rule of law, participation and human rights, sustainable economic opportunity, and human development. The IIAG is used as a tool to measure government performance. The 2016 IIAG consists of 95 indicators that are formed by 166 variables, from 34 independent, external data sources. Khanna *et al*. (2005) define this as the

effectiveness of a country's banks, insurance companies, and other financial institutions: how well they are managed, and how effective corporate governance norms and standards are in protecting shareholder interests. Harvard Business School professors Khanna & Palepu (2013) coined the phrase 'institutional void' (IV) in a *Harvard Business Review* article in 1997, and have since done ample research on the topic. IVs are defined as the absence of intermediaries such as market research firms, logistics providers, or credit card systems in a market – all of which give rise to operational challenges when doing business in the specific market. IVs relate to "unfamiliar conditions and problems" (Arnold & Quelch, 1998) that characterise emerging markets and can deter firms from entering (Jansson, 2007).

2.3.2.3 Ease of doing business

Foreign investors face uncertainty about the laws and regulations of new markets, including matters such as restrictions on business ownership, difficulty in returning profits to the firm's host country, and insufficient laws for protecting intellectual property (Ahsan & Musteen, 2011). According to Levi *et al*. (2003), flexibility, research, and negotiation skills are critical for business success in developing countries, as operating standards vary greatly, and some institutions may place little value on contractual agreements. The Ease of Doing Business ranking (The World Bank, 2017) is an index developed to measure these factors. A high 'ease of doing business' ranking means that the regulatory environment is more conducive to starting and operating a local firm. The rankings are determined by sorting the aggregate distance to frontier scores on 10 topics, each consisting of several indicators. Research completed by Ghemawat (2001) focuses on four dimensions of distance that impact the ease of doing business: culture, administration, geography, and economy. Before entering a foreign market, it is important to have prior knowledge of business and personal taxes in the market. These include revenue and income tax, inventory taxes, and property taxes – all of which would impact the cost of doing business in a country.

Near-market or experiential knowledge: The terms 'foreign institutional knowledge', and 'near-market knowledge' can be used interchangeably. A study by Mitra & Golder (2002) presents the theory of near-market knowledge as the economic and cultural insight that a firm possesses on prosperity, size, infrastructure, and accessibility of a new market they are entering. (The term 'near-market' has little to do with the geographical proximity of markets.) A firm's previous experience in similar international markets could contribute to a successful entry into the new market as learnings and the ability to deal with certain issues are transferred (Ahsan & Musteen, 2011), (Kuivalainen, Sundqvist, Saarenketo, McNaughton & Sandberg, 2013). Mitra & Golder's publication is one of the first to highlight the benefits of a firm's experience in similar economic markets during the process of internationalisation, as the firm could more confidently and effectively deal with uncertainties in the new market. Near-market knowledge is considered to be a 'soft' or qualitative variable that would be very hard to quantify. For this reason, the variable should be excluded from further analysis.

Logistics and physical infrastructure: The quality of a country's infrastructure is an indicator of the so-called 'geographic distance', as it correlates with the lead time of distributing goods to the final destination.

Infrastructure includes airports, ports, national highways, public transport, and communication systems. Especially in the retail distribution industry, the quality of available transportation modes is a high priority in supply chain management (Coyle *et al*., 2013). Road quality, access to reliable trucks, and transport safety are all potentially challenging areas when considering emerging African countries. There is a distinct difference in the quality of infrastructure between developed and developing countries, as an emerging economy's gross national income may not yet be sufficient to implement an advanced logistics infrastructure (Levi *et al*., 2003). Security at ports and airports also plays a major role in foreign trading considerations (Coyle *et al*., 2013). A major drawback of Africa's geography is the inability to use rivers as a transportation mode. Most of the continent's rivers begin in high land and descend in abrupt drops, making navigation difficult and hindering the formation of large trade regions (Marshall, 2015). Smooth coastlines have few natural harbours, which has long hindered foreign trade. Over the past 10 years, however, there has been an increase in the development of man-made infrastructure such as artificial ports along the African coastline.

Mitra & Golder (2002) explain that countries with a developed infrastructure are considered more attractive for foreign investment, as the cost of distribution will be lower and access to customers higher than in countries with less evolved distribution channels. The Logistics Performance Index provides a domestic and international scorecard based on factors such as efficiency of border and customs processes, quality of physical infrastructure, the competence of logistics services, and supply chain reliability.

According to Coyle *et al*. (2013), nearness-to-market usually takes into consideration both logistical and competitive factors. Logistically, customer proximity is decreased where transportation is available, freight costs are lower, and there is a larger (and higher density) market size. A country with well-developed transport infrastructure is considered more attractive to foreign investors, as it enables the distribution of goods to customers at lower costs and a faster rate, potentially reaching a wider radius of consumers with a reduced lead time (Mitra & Golder, 2002). Lenartowicz & Balasubramanian (2009) refer to distribution in developing countries as the 'last-mile' problem, highlighting the challenge of outbound logistics that is especially prevalent in the retail format in developing markets.

Trade agreements and ease of trading across borders: Schmitz (2006) states that there is a direct correlation between the amount of trade between regions and the economic growth of a market. According to Djankov, Freund & Pham (2010), long lead times and a high cost of trading across borders greatly impact successful trade between countries. It is estimated that, for each day that cargo is delayed at a border, inter-country trade will be reduced by up to 1 per cent (Djankov *et al*., 2010). Trade agreements between countries increase the ease of doing business, as there is an unhindered flow of goods and enhanced cross-border movement of goods and services. 'Most favoured nation' status provides lower duties and customs, and simplifies administration at the border (Coyle *et al*., 2013). Even though many African regions have entered into bilateral and multilateral trade agreements, corruption is still a reality across emerging African markets, hampering the effectiveness of these agreements. Djankov *et al*. (2010) estimate that it takes 48 days on average to process an export product in Sub-Saharan Africa (based on the time it takes for the product to

move from the processing plant until it is loaded on to a ship). Ghemawat (2001) states that when countries share a border, have a common language/polity/currency, and belong to the same regional trading bloc, this increases the ease of doing business with one another, and will increase the chances of successful multinational ventures. The Ease of Doing Business indicator gives a quantified estimate of how accessible a country is with respect to its trade borders.

2.3.3 Conclusion to Literature Section 2

According to Brouthers (2013), many papers on internationalisation emphasise financial performance factors for modelling market entry decision-making. Brouthers (2013) believes that secondary data should not be analysed as a separate stream of research, but should rather be modelled in combination with other influencing streams to ensure that a holistic approach is taken and that the correct emphasis is placed on all the elements influencing market-entry decisions. This approach will guard against an oversimplification of the decision-making process. In the next two paragraphs, research is conducted in the fields of supply chain management and financial management to ensure that a holistic approach is taken toward model construction.

The second section of the literature review serves as the first part of empirical data gathering to answer the second research question: ‘What qualitative variables need to be included in a strategic decision-support model, and how are they to be converted into measurable variables?’ By using key search phrases on the highest level of research, many variables have been identified as being well representative of the ‘opportunity’ and ‘risk’ of entering a foreign market, such as the GDP *per capita* of the population, the extent of foreign direct investment in the economy, the adult literacy rate in a country, or the ease of doing business in the economic climate. Each of these variables could be taken into consideration during foreign market expansion, but it would be a time-consuming and complex exercise if every one of these were to be included in a decision-support model. For this reason, further content analysis is conducted in Chapter 4 as part of the data collection section of the thesis, to refine the list of variables and to a smaller selection that would be most apt for inclusion in a decision-support model for foreign market expansion.

2.4 MAIN CONCLUSIONS / SUMMARY OF LITERATURE REVIEW

Decision-making in the context of foreign market entry is a growing field of research, and there are still many opportunities to synthesise these research findings across the various disciplines by conducting a literature analysis. The various disciplines considered during the literature review include supply chain management, economics of development, and business management. The literature search returned a wide range of research articles across each of the disciplines, which make it clear that the research problem stretches across the various fields of study; and thus it is concluded that a holistic approach should be taken when synthesising a decision-support model in the context of this thesis.

This chapter takes a systematic approach to providing a thorough scholarship review of relevant literature on the research topic of foreign market expansion. The review is introduced by defining each of the main constructs derived from the research problem, including concepts such as 'global supply chain network', 'engineering economics for complex decision-making', and 'foreign market entry'. Thereafter, Chapter 2.2 identifies the tools and techniques that would be most apt for the construction of a decision-support model, including the Analytical Hierarchy Process, supply chain distribution network design, Monte Carlo simulation, sensitivity analysis, what-if analysis, and the strategic profit model. Chapter 2.2 concludes with the 'cost' and 'benefit' variables that should be included in the model, being the total unit demand and sell price per unit; the cost of goods sold; total operating cost; gross margin as an indicator of profitability; and lastly, the return on assets.

Chapter 2.3 builds on the first iteration of the literature review by adding key phrases to the literature search, which leads to a comprehensive list of 'opportunity' and 'risk' variables that researchers have considered in the past as being important to consider during foreign market expansion. The list includes variables such as the GDP *per capita* of the population, the extent of foreign direct investment in the economy, the adult literacy rate in a country, and the ease of doing business in the economic climate. The variables are indicators of the economic attractiveness of a market or economy. These findings are used as variable inputs to the empirical data collection in Chapter 4, where a rigorous content analysis will be conducted with the aim of selecting the variables that should be included in the final decision-support model constructed in Chapter 5, to address the research problem of the thesis.

The literature review concludes that many papers have been published on the research topic across various disciplines, but that few of them consider a holistic inter-disciplinary approach. Therefore, the originality of the research scope adds to the current body of knowledge – not only academically, but also in consulting practice. The complex decision-making process of South African retailers expanding into foreign African markets is a contemporary issue. A rigorous decision-support model could be constructed by combining various tools and techniques, which could lead to improved predictions and potentially mitigate risks during foreign market entry.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

Chapter 3 proposes the modelling approach used to address the research problem, and includes a discussion on the theory behind the selected research design for constructing a strategic decision-support model which requires a combination of qualitative and quantitative research approaches. Systems thinking is applied to synthesise the various methodologies in a creative and holistic manner. The chapter is divided into three discussions: the modelling approach that is used, the theory behind the research methodology, and the potential shortcomings of this approach.

3.1 MODELLING APPROACH

The modelling approach selected in this thesis is based on various methodologies from the discipline of industrial engineering to create a strategic decision-support model. A discussion follows on how systems thinking is applied to the research problem, a note on the scope of the model, and the engineering method followed during construction of the strategic model.

3.1.1 Systems thinking

The thesis addresses a multi-disciplinary research problem that requires a combination of qualitative and quantitative research approaches. Systems thinking is applied to synthesise the various methodologies in a creative and holistic manner. To ensure that the correct research design is selected and applied to the strategic investment decision, an understanding is required of the system as a whole, as there are multiple influencing factors to take into consideration. From the literature review it is apparent that many studies have addressed the research topic in isolation from the viewpoint of a single discipline (such as supply chain management, economics of development, or financial management), but few papers approach the problem across these disciplines with an all-encompassing systems view. From this conclusion in the literature study, a gap is identified to address the topic of foreign market expansion in a holistic manner. Therefore, this thesis applies a systems thinking approach during model development to gain comprehensive insights into various investment scenarios, and to make informed business decisions during foreign market entry (as explained in Chapter 2.2.6).

As mentioned in Chapter 1.2.3, the decision-support model developed in this thesis will be designed for the strategic level, with tactical or operational variables falling outside of its scope. This approach leads to a strategic design of a ring-fenced system – that is, synthesising a model in terms of its inputs and outputs without deep-diving into the knowledge of the internal workings of the system.

According to Ghaffarzadegan, Lyneis & Richardson (2011), the ability to build a small model that satisfies the required level of accuracy is called ‘model parsimony’, and it assists data analysts to understand the input and output variables of a model better. Furthermore, Ghaffarzadegan *et al.* (2011) also state that a smaller

model allows for more replicatable experimentation in a virtual laboratory, and for rigorous sensitivity analysis to interpret the modelled results.

3.1.2 Engineering (or scientific) method

According to Montgomery & Runger (2010), engineers use the engineering (or scientific) method to solve problems of interest to society by efficiently applying scientific principles. The same practical approach is used to address the research problem stated in Chapter 1, and consists of the following steps:

i. State the research problem
ii. Identify all variables that have an effect on the problem, or may play a part in its solution
iii. Construct a proposed model to address the problem, using engineering knowledge of the phenomenon being addressed (limitations and assumptions to be clearly stated)
iv. Collect and analyse data for testing and validating the proposed model
v. Refine the model based on the findings of the analysis
vi. Manipulate the model to come to the final solution of the problem
vii. Conduct a statistical analysis to test whether the proposed solution is sufficient
viii. Draw conclusions and make recommendations based on the findings

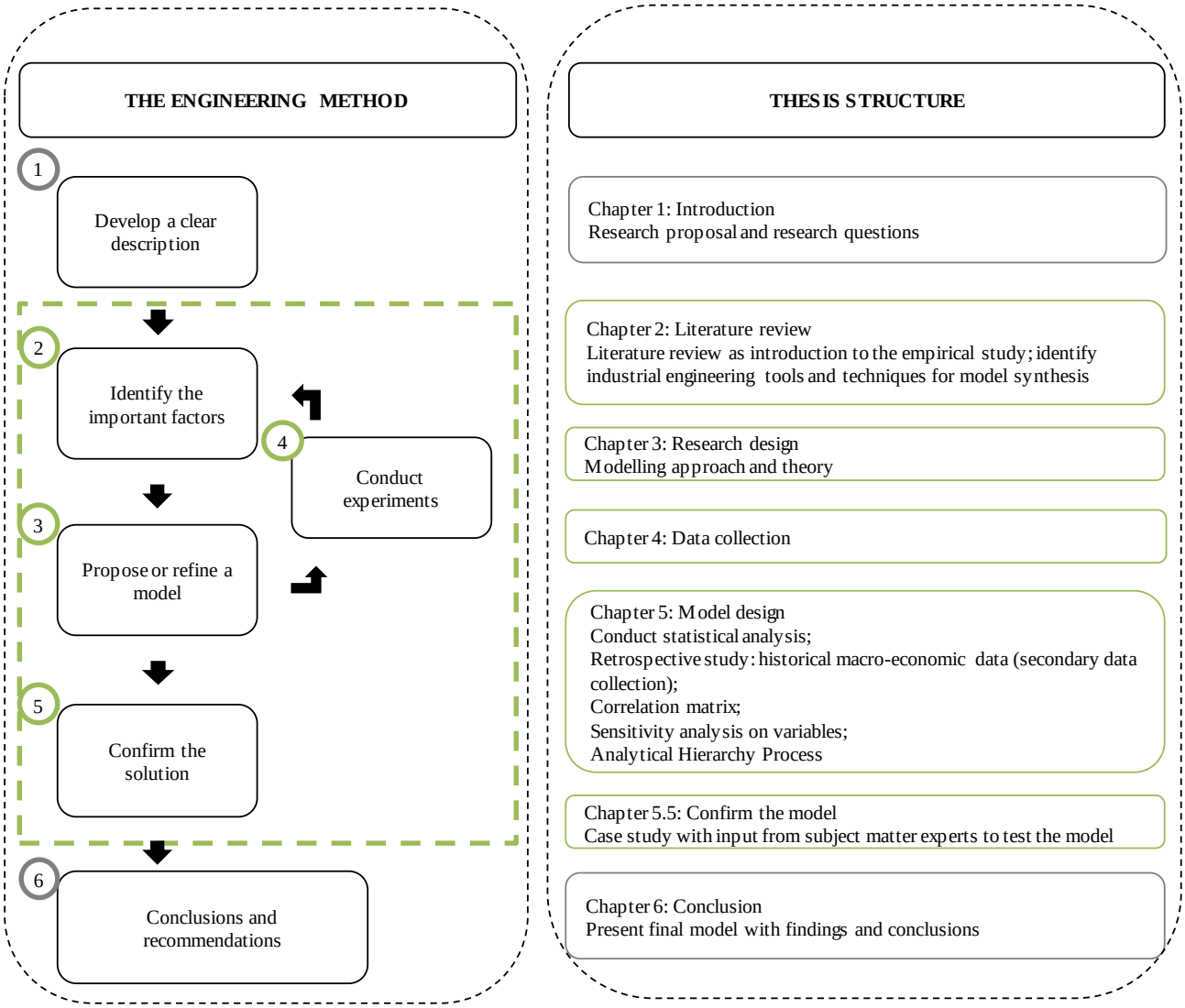

Figure 3-1: Modelling approach derived from the engineering (or scientific) method

Figure 3-1 depicts the engineering method, how it correlates with the research methodology, and where each step fits into the final structure of this thesis. The scientific method is followed during the model design in Chapter 5.

3.2 RESEARCH DESIGN THEORY

The aim is to construct a model to simulate a real-world phenomenon, rather than to test a specific hypothesis, which requires a combination of qualitative and quantitative research approaches, and leads to an overarching qualitative research approach. When a research case does not fit into one particular research design theory, the application of a qualitative research approach lends itself aptly to address the research problem (Welman, Kruger & Mitchell, 2005). To ensure that a holistic approach is taken to model development, a hybrid of research methodologies is applied, including an empirical literature analysis, secondary data analysis, statistical modelling and simulation, and sensitivity analysis. A discussion follows on the theory behind each of the selected research methodologies.

3.2.1 Literature content analysis and secondary data analysis

The literature review in Chapter 2 serves as an introduction to the research, to identify which tools, techniques, and variables should be taken into consideration during model development. As part of the conclusion to the chapter, a list is presented of 'opportunity' and 'risk' variables that should be considered for inclusion in a decision-support model. to determine which of these variables would be the most representative of the 'opportunity' and 'risk' constructs, the findings from the literature review will be used as part of the data collection in Chapter 4, as a 'literature content analysis' is undertaken. (The 'content analysis' is a statistical analysis conducted on media sources, in addition to the literature review in Chapter 2.)

A 'content analysis' can be described as a quantitative analysis of qualitative data, using the technique of counting frequencies and sequencing key words, search phrases, and synonyms (generally applied to data consisting of a body of text) (Welman *et al*., 2005). Duriau, Reger & Pfarrer (2007) explain that many definitions have been developed for 'content analysis', and the research approach, method, and techniques should be clarified when referring to 'content analysis'. Shapiro & Markoff (1997:14) define 'content analysis' as "any methodological measurement applied to text for social sciences purposes" (Roberts, 1997). Duriau *et al*. (2007) refer to the research of Abrahamson & Hambrick (1997) to further conclude that word frequency is regarded as an indicator of importance, and state that "co-occurrences of keywords can be interpreted as reflecting association between the underlying concepts" (Duriau *et al.*, 2007:6).

Once the exhaustive list of 'opportunity' and 'risk' variables have been refined to a smaller selection of representative variables, historical secondary data will be collected for each variable (discussed further in Chapter 4). Secondary data analysis is an empirical and quantitative method of analysing existing data in order to build and validate models (Welman *et al*., 2005). Mouton (2011) mentions that secondary data collection holds many benefits (compared to primary data collection) such as saving time and money, as the required surveys are already available for analysis. On the other hand, Mouton (2011) warns that data collection errors are outside of the analyst's control and knowledge, and only reputable sources should be used.

3.2.2 Statistical modelling and simulation studies

The aim of building a model is to simulate real-world phenomena as accurately as possible. A simulation model is developed with a combination of deterministic and stochastic elements to understand better the input and output variables and the effects that they have on one another. Analysis of the results can guide us in better decision-making. According to Mouton (2001), 'statistical modelling and simulation' is an empirical research design that uses a mix of primary and secondary data. A typical application of this type of research design is the modelling of data for investment analysis (Mouton, 2001), and would thus be an appropriate application for addressing the research problem of this thesis. Furthermore, this design proves to have many strengths, including the ability to model large-scale issues or problems and to simplify

relationships in order to understand the system better, which coincides with the systems approach taken throughout the thesis.

Assumptions and underlying theories need to be thoroughly understood, conveyed, and specified in the model. Wolstenholme (1999) emphasises that a simple, balanced, and sophisticated model needs to be created at a satisfactory level of detail within the available resources of time and space. For the purposes of the research problem addressed in this thesis, Microsoft Excel is used to not only construct, but also test the proposed decision-support model (further discussed in Chapter 5: Model design). Microsoft Excel add-ins such as 'Analysis ToolPak' (Microsoft, 2017) and 'Risk Kit'(Wehrspohn, 2017) have been identified as suitable for the purposes of comprehensive data analysis that falls outside the capabilities of standard Microsoft Excel software. A comparative list of Microsoft Excel add-ins that has been considered for data analysis under uncertainty is included in Appendix 0. Freeware (software that is available for use at no monetary cost) is also investigated for the simulation of the Analytical Hierarchy Process, from which a basic Microsoft Excel sheet created by K.D. Goepel (2013) is selected as the most comprehensive and user-friendly tool for the purpose.

Various research methodologies are used to identify the required inputs and outputs of the final decision-support model, to ensure a holistic approach and solution, including a secondary data analysis (conducted across the macro-economic variables identified during the literature review (Chapter 2.3)), a statistical analysis and sensitivity analysis conducted across selected variables to test the rigour of the proposed model and primary data collection for conducting a case study on a subsection of the final model.

3.2.3 Statistical and sensitivity analyses

When data analysis is conducted on data points that contain a high level of uncertainty, it is critical to perform a sensitivity analysis to identify the variables that have the highest impact on the output of the model. Sensitivity analysis is a statistical technique used to measure the variation of different input variables that might affect the final output of the model. Small variations in a model that lead to drastic variations in the outputs are indicative of a sensitive model (Newnan *et al*., 2004). Sensitivity analysis is done by incrementally changing selected input variables, while keeping all other variables fixed, and tracking the intensity of the changes across the final output graphs.

3.2.4 Case study based on primary data collection

A case study is a research method in which a limited number of units of analysis are studied, with the aim of understanding the uniqueness of a particular case in all its complexity (Welman *et al*., 2005). Purposive sampling is used to identify a selection of industry experts who are well representative of a population within the scope of research. Purposive sampling is a type of non-probability sampling in which the researcher relies on the experts' experience to obtain a sample selection. These industry experts are approached to

complete an opinion poll based on the analytical hierarchy process of the final proposed model that forms part of the case study.

3.3 SHORTCOMINGS AND SOURCES OF ERROR

Three main shortcomings and sources of error are identified with the selected research approach: i) The hybrid approach of using both quantitative and qualitative research methodologies; ii) The potential data errors when collecting secondary data; and iii) General challenges with statistical modelling and simulation studies. The potential pitfalls are discussed below, with suggestions on how the sources of error will be minimised.

Given the research problem addressed in the thesis, a combination of qualitative and quantitative research methodologies is required. If used correctly, this holistic approach will successfully address the research problem, but scientific rigour should be maintained throughout model development. A hybrid of quantitative statistical analysis methods will be used to validate and confirm the proposed model construct.

Secondary data is collected for macro-economic variables in sub-model 1. According to Welman *et al*. (2005), secondary information sources may contain data errors outside of the analyst's control and knowledge, as a transfer from one resource to another may inadvertently distort information, and also mentions that analysis may be constrained by the initial objectives of the census-taking. To minimise the risk proposed by Welman *et al*. (2005), secondary data will only be collected from reputable sources including the World Economic Forum, the Ibrahim Index of African Governance, the PRS Group, and the World Bank.

Wolstenholme (1999) points out some challenges in using statistical modelling and simulation studies, such as the availability and accuracy of data, and the complexity of the system being modelled. Wolstenholme (1999) also states that simulations can be "idealised representations of the real-world, inhibited by the restrictive nature of the feedback loops", which could be seen as a limitation during research. During model development, the interaction of variables is observed, but not necessarily the intensity of their influence on one another. To ensure the final proposed model does not propose a distorted representation of the research problem, the model will be confirmed by validating each sub-model.

CHAPTER FOUR: DATA COLLECTION

Chapter 4 discusses the approaches used for data collection. Various data requirements are discussed, and the chapter expands on the data sources, the instruments of measurement, sampling design and methods.

4.1 DATA FOR LITERATURE CONTENT ANALYSIS

The literature review in Chapter 2 serves as the introduction to empirical data collection for model validation. Chapter 2.2 (Literature section 1) is the first iteration of the literature review, using key words and search phrases from Table 4-1 below.

Table 4-1: Key words and search phrases for the first iteration of literature review

LITERATURE SEARCH ITERATION 1
KEY CONSTRUCTS
strategy / decision-making / uncertainty/ tools, techniques, methods /
investment / market expansion / diversification / distance to market /
foreign market entry / internationalisation / cross-border / multinational
CONTEXT / SCOPE OF STUDY
developing / emerging markets /
Africa / Sub-Saharan Africa /
retail / apparel & clothing / consumer products /
macro-economics / supply chain / engineering economic analysis

The findings from this review lead to the second iteration of the literature search in Chapter 2.3 (Literature section 2) – with additional key words and search phrases used, as listed in Table 4-2 below.

Table 4-2: Key words and search phrases for the second iteration of literature review

LITERATURE SEARCH ITERATION 1
KEY CONSTRUCTS
strategy / decision-making / uncertainty/ tools, techniques, methods /
investment / market expansion / diversification / distance to market /
foreign market entry / internationalisation / cross-border / multinational
CONTEXT / SCOPE OF STUDY
developing / emerging markets /
Africa / Sub-Saharan Africa /
retail / apparel & clothing / consumer products /
macro-economics / supply chain / engineering economic analysis
LITERATURE SEARCH ITERATION 2
economic variables / economic impact /
market attractiveness / potential / opportunity / advantage /
risk of market entry / restrictions / constraints / challenges /
qualitative / quantitative variables

From the first and second iterations conducted in Chapter 2, it is concluded that the following macro-economic variables are considered as important for consideration during foreign market expansion:

- Opportunity: Variables that indicate economic attractiveness (such as GDP / GDP growth / population growth / FDI inflow / competitiveness); variables that could be indicative of the size of the target market (such as GDP *per capita* / urban population / population density / age distribution); and the qualitative variable of brand recognition and other marketing factors
- Risk: Variables that are indicative of the labour climate in the country, as well as measures of development (such as the yearly cohort of new labour entrants / adult literacy / access to water / life expectancy); variables that reflect the political and social climate (such as corruption / governance / economic freedom); and lastly, variables that reflect the ease of doing business (ease of doing business / logistics performance / trade across borders)

This list of 'opportunity' and 'risk' variables is considered as the first part of data collection for an empirical literature content analysis – with the aim of answering the second research question: 'What qualitative variables need to be included in a strategic decision-support model, and how are they to be converted into measurable variables?' From this conclusion to Chapter 2, a third iteration of the literature review is now conducted, based on the key phrases in Table 4-3**Error! Reference source not found.**.

According to Welman *et al*. (2005), 'content analysis' is the quantitative analysis of qualitative data through a technique that involves counting the frequencies and sequencing of words, phrases, or constructs. Other statistical summaries and correlation matrices will also be included in this analysis in Chapter 5.2.1. This will be an iterative process to ensure that: i) a holistic set of variables serves as input to the final model, ii) the selected variables are well representative of the 'opportunity' and 'risk' factors that influence foreign market expansion, and iii) variables are not duplicated.

The goal of the literature content analysis is to get a holistic view of all potential macro-economic factors that have been considered important by researchers in the past (specific to the areas of supply chain management, economics of development, and business management), and to refine the findings to a list of variables that should be included in a decision-support model.

Table 4-3: Key words and search phrases for the third iteration of literature review

LITERATURE SEARCH ITERATION 1
KEY CONSTRUCTS
strategy / decision-making / uncertainty/ tools, techniques, methods /
investment / market expansion / diversification / distance to market /
foreign market entry / internationalisation / cross-border / multinational
CONTEXT / SCOPE OF STUDY
developing / emerging markets /
Africa / Sub-Saharan Africa /
retail / apparel & clothing / consumer products /
macro-economics / supply chain / engineering economic analysis
LITERATURE SEARCH ITERATION 2
economic variables / economic impact /
market attractiveness / potential / opportunity / advantage /
risk of market entry / restrictions / constraints / challenges /
qualitative / quantitative variables
LITERATURE SEARCH ITERATION 3
consumer behaviour / demand / market size /
market orientation / brand recognition / market saturation /
distance to market / institutional voids /
entry strategies / entry mode / entry node /
retail trends / window period of opportunity /
distribution / value chain / supply chain /
economic growth / urbanisation / population density /
political or social impact / geographic characteristics /
doing business / governance / trade and imports / transport and logistics /
risk aversion / risk attitude / tolerance /
base of pyramid / middle class

The third iteration of the literature review (as part of the data collection process) returns a large sample of media, and the process of variable refinement is discussed below.

4.1.1 Third iteration of literature review as part of data collection

The universe of appropriate media selected for sampling, consists of peer-reviewed journal articles (selected based on search phrases identified in Table 4-3); textbooks and other published books across the fields of economics, supply chain network strategy, supply chain management; current technical reports (no older than five years) from corporate companies that are experienced in strategic decision-making for retail clients (including the 'big four' audit firms, KPMG, PwC, EY, Deloitte); and current technical reports[3] (no older

[3] 'Technical reports' include government publications (such as White Papers) and reports published by banks, institutions and organizations that are considered to be reputable sources.

than five years) published by financial institutions such as the World Bank and the African Bank, and intergovernmental organisations such as the United Nations and the World Trade Organization.

In order to conduct an analysis across the variables, the various units of analysis are coded. A typical issue with qualitative research is that it is done with words that could have multiple meanings, as opposed to the rigour found in a study of numbers. To reduce the complexity and break huge amounts of data into manageable pieces, the solution is to code (or translate) the various words into symbols. The outcome of the analysis will answer the second research question: 'What qualitative variables need to be included in a strategic decision-support model, and how are they to be converted into measurable variables?'

4.1.1 Media sampling for literature content analysis

A universe for appropriate media sampling is selected from peer-reviewed journal articles, textbooks, and technical papers. Peer-reviewed journal articles and textbooks will carry the most weight, with technical papers and other indices contributing as supporting material.

The content analysis approach of Duriau et al. (2007) is used by adopting a multi-stage strategy. First, the major academic journals in the Proquest and Ebsco databases are searched, based on the selection of key words and search phrases listed in Table 4-3. Date filters are applied for the search to return articles no older than 15 years. This time frame is selected, as it corresponds with the vast economic and social improvements that African markets have shown since Africa was described as a "hopeless continent" (Economist, 2000) (see Chapter 1.1.3). Journals searched include *The International Journal of Management Reviews, Journal for International Business and Entrepreneurship Development, Journal of International Business Studies, Journal of Business Research, Journal of Fashion Marketing and Management: An International Journal, Journal of International Marketing, International Journal of Physical Distribution & Logistics Management, International Journal of Economics and Finance,* and *International Journal of Retail & Distribution Management*. To ensure that the sample selection of media is representative of the research that has been published, the reference lists of the articles are also reviewed to determine whether there are further studies compiled on the same topic. The sample size of the selection is only constrained by the time and resources that this study allows.

4.1.1.1 Journal articles

Journals are explored across the disciplines of supply chain management, economics, and business commerce. Only peer-reviewed articles are considered, none of them older than ten years from date of research initiation[4], and found to have been referenced often by other scholarly articles (in other words, papers that have a high citation impact). Literature research was based on key constructs and search phrases such as 'emerging markets', 'African retail development', and 'market expansion' (full list in Table 4-3).

[4] Literature review officially commenced in the year 2016.

4.1.1.2 Textbooks

Multiple textbooks across the disciplines of supply chain management, economics, and business commerce are researched, with the latest edition not being older than 15 years from date of research initiation (see footnote 4).

4.1.1.3 Technical papers

A compilation of current and relevant technical papers published by corporate companies is considered. Only companies that are perceived as highly knowledgeable on the topic of strategic decision-making and that are often approached by retail clients for their management consulting expertise (such as KPMG, PwC, EY, and McKinsey & Company) are included in the sample selection. Other global financial institutions such as the World Bank and the African Bank, as well as intergovernmental organisations such as the United Nations and the World Trade Organization, are also considered as sources of technical papers. The technical papers selected may not have a publication date older than five years (from date of research being initiated) to ensure that the research is as relevant as possible to the focus of the study.

4.1.1.4 Other indices

Multiple organisations and institutions have attempted to create indices that are useful for decision-making within a similar context to that of this research study. These indices are not necessarily based on rigorous research; examples include the Market Potential Index (developed by Michigan State University), the Ibrahim Index of African Governance (Mo Ibrahim Foundation), Ease of Doing Business (World Bank Group) and the African Retail Development Index (AT Kearney). The only indices considered during the construction of a decision-support model in this study are those with a publication date of no older than two years (from date of research being initiated).

4.1.1.5 Methodology for collecting media samples

This approach returned a sample of 85 media sources (peer-reviewed journal articles, books, technical papers, and indices).

After conducting a thorough review of the units by using all search phrases in iterations 2 and 3, a total of 45 (out of the original 85) units are identified as being valuable for further analysis. The 40 units that are removed from the sample selection have been excluded for one or more of the following reasons: the relevance to the research context is found to be too low; the number of times the paper has been cited by other scholars is very low (indicative of a low scholarly impact); the source is outdated, or has been published so recently that there have been few opportunities for scholarly review; the source is found to be biased or unreliable; the main findings of the paper have been cited in another paper that is already included in the sample, and its inclusion would skew the data analysis; or it is decided that all developed indices should be excluded with the intention of maximising the academic rigour of the research.

Table 4-4: The final sample selection of 45 media sources

Sample name	Source
A retrospective on: Institutional, cultural and transaction cost influences on entry mode choice and performance	Brouthers (2013)
Africa by numbers: Assessing risk and opportunity in Africa	Ernst & Young (2013d)
An examination of international retail franchising in emerging markets	Welsh *et al*. (2006)
Beyond entry mode--SME escalation in emerging markets: A conceptual framework	Akbar *et al*. (2014)
Commodity chains and global capitalism	Gereffi & Korzeniewicz (1994)
Comparing capitalisms: Understanding institutional diversity and its implications for international business	Jackson & Deeg (2008)
Consumer profiles of apparel product involvement and values	Kim (2005)
Designing and managing the supply chain: Concepts, strategies, and case studies	Levi *et al*. (2003)
Distance still matters	Ghemawat (2001)
Does Foreign Direct Investment Reduce Poverty in Africa?	Gohou & Soumaré (2012)
Economics of development	Gillis *et al*. (2006)
Effective distributor governance in emerging markets: The salience of distributor role, relationship stages, and market uncertainty	Dong, Tse & Hung (2010)
Emerging market entry node pattern and experiential knowledge of small and medium-sized enterprises	Kuivalainen *et al*. (2013)
Ernst & Young's attractiveness survey: Africa 2015	Ernst & Young (2015a)
Exporters moving toward emerging markets: A resource-based approach	Bortoluzzi, Chiarvesio, Di Maria & Tabacco (2014)
Foreign aid, foreign direct investment and economic growth in Sub-Saharan Africa: Evidence from pooled mean group estimator (PMG)	Njoupouognigni & others (2010)
Foreign direct investment in Africa: Performance, challenges, and responsibilities	Dupasquier & Osakwe (2006)
Foreign direct investment in Southern Africa: Determinants, characteristics and implications for economic growth and poverty alleviation	Jenkins & Thomas (2002)
Global production networks and the analysis of economic development	Henderson, Dicken, Hess, Coe & Yeung (2002)
Global production networks, knowledge diffusion, and local capability formation	Ernst & Kim (2002)
Global value chains and international competition	Gereffi (2011)
Governance indicators: Where are we, where should we be going?	Kaufmann & Kraay (2008)
How we compete: What companies around the world are doing to make it in today's global economy	Berger (2005)
Internationalization in retailing: Modelling the pattern of foreign market entry	Gripsrud & Benito (2005)
Learning and earning in global garment and footwear chains	Schmitz (2006)
Local clusters in global chains: The causes and consequences of export dynamism in Torreon's blue jeans industry	Bair & Gereffi (2001)
Managing Risk in an Unstable World	Bremmer (2005)
Managing supply chains: A logistics approach	Coyle *et al*. (2013)
Market penetration and acquisition strategies for emerging economies	Meyer & Tran (2006)
Megatrends 2015 – Making sense of a world in motion	Ernst & Young (2015b)
Multinational enterprises' entry mode strategies and uncertainty: A review and extension	Ahsan & Musteen (2011)
Practices and performance of small retail stores in developing economies	Lenartowicz & Balasubramanian (2009)
Prisoners of geography: Ten maps that tell you everything you need to know about global politics	Marshall (2015)
Promoting of investment in Africa	Anyanwu (2006)
R&C worlds express: Opening the door to Africa	PwC (2013b)
Redefining business success in a changing world: Global survey of investor and CEO views	PwC (2016b)
Retailers' expansion mode choice in foreign markets: Antecedents for expansion mode choice in the light of internationalization theories	Picot-Coupey, Burt & Cliquet (2014)
Sector report: The African consumer and retail	KPMG (2015)

Sample name	Source
Strategies that fit emerging markets	Khanna *et al*. (2005)
The Africa business agenda: Changing gear	PwC (2017)
The eclectic paradigm as an envelope for economic and business theories of MNE activity	Dunning (2000)
The Economic Performance of Regions	Porter (2003)
The global apparel value chain, trade and the crisis: Challenges and opportunities for developing countries	Gereffi & Frederick (2010)
Trading on time	Djankov *et al*. (2010)
Whose culture matters? Near-market knowledge and its impact on foreign market entry timing	Mitra & Golder (2002)

4.1.2 Final variable list compiled from literature review

From the Conclusion to Literature section 1 (Chapter 2.2.9) and from the final sample selection of sources listed in Table 4-4, an exhaustive list is now compiled of all the qualitative macro-economic variables that are important when considering retail expansion into foreign markets. A total of 80 distinct variables have been identified (as listed in Table 7-1 in Appendix A) and are coded for further content analysis. The exhaustive list of 80 macro-economic variables is now filtered to exclude duplicate constructs. Each variable is classified according to the rigour of its unit of measure (being a 'hard', 'medium', or 'soft' variable). Any construct classified as having a 'hard' unit of measure, but with no secondary data publicly available, is excluded from the list. Furthermore, where a variable has secondary data available for both rural and urban areas of the country (for example: for the measure of a country's population size, data is available for both rural and urban areas and these data points might differ considerably), the urban data points are used.

4.1.3 Causal loop diagram

Systems thinking is used to understand the relationships between all selected variables by constructing a causal loop diagram (CLD), which is used as a visual representation to identify the impact that variables have on one another and to make informed deductions on how further to group variables together. This will assist in refining the final variable list by removing redundant variables and identifying the ones that would have the greatest influence on the strategic issue at hand. The CLD gives a holistic view of the macro-economic system, providing insights into which dimensions carry the most weight in the system, and how the loops are feeding into one another.

To simplify the mapping process, all the variables have been grouped into 'dimensions' (groupings of variables that represent a similar construct into a single measure). The variables for 'sanitation coverage' and 'access to water', for instance, are grouped together to be a single representation called 'level of access to basic services'.

Mapping a CLD is an iterative process; and for the purposes of this specific study it is used for qualitative analysis only, as the intensity of each loop is not calculated. An example of the iteration is shown in Figure 4-1, by using Vensim ® PLE software (Ventana Systems, 2016).

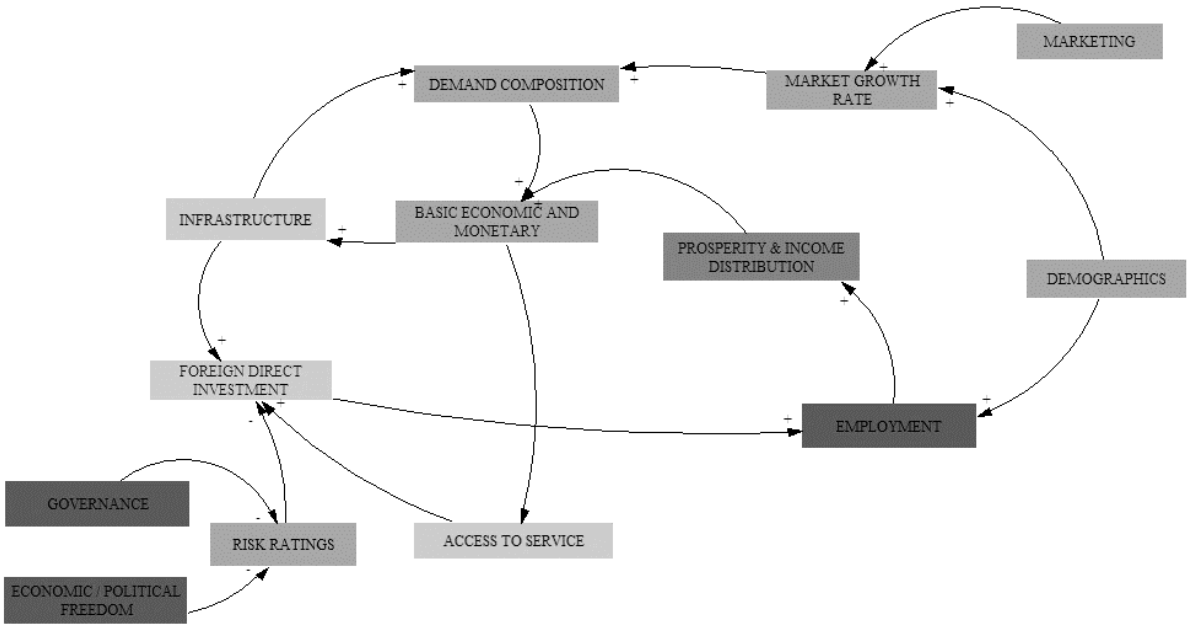

Figure 4-1: A Causal Loop Diagram iteration

By completing multiple iterations of conveying variable dimensions on the CLD drawings (considering the effect of variable dimensions on one another), the deduction is made about which dimensions should be included for further content analysis. From critical review of the final iteration in Figure 4-1 (and keeping the specific research context in mind), various economic and demographic variables are included that are indicative of market opportunity, such as poverty and income distribution, basic economic and monetary indicators, variables on the quality of infrastructure, demand composition, or market growth rate, as well as indicators of foreign direct investment. Variables that are indicative of the risk of entering a new market include access to basic services (or, more accurately, the lack of access), various indicators of the level of governance, and variables that represent economic and political freedom.

4.2 HISTORICAL SECONDARY DATA OF MACRO-ECONOMIC VARIABLES

Based on the variables identified during the literature content analysis (as explained in Chapter 4.1), historical data is now collected from secondary sources for each identified variable. For the purposes of the research study, the units under investigation in the content analysis are the macro-economic variables that represent the ‘opportunity’ and ‘risk’ of foreign market expansion. Secondary data analysis is an empirical and quantitative method of analysing existing data in order to build and validate models. Typical data sources include census data, secondary analysis of survey data, and market analysis; and there is a medium amount of statistical control. This type of analysis is suitable for addressing research questions of a descriptive and causal nature (Mouton 2011). Secondary data analysis requires the researcher to be explicit about underlying theories and assumptions.

Typically, the primary data is collected from cross-sectional census surveys such as those done by Statistics South Africa, the World Bank, or the United Nations. One of the benefits of secondary data analysis is the time and money saved from not having to do data collection, as the required surveys are already available for analysis.

4.3 QUESTIONNAIRES FOR SUBJECT MATTER EXPERT INPUT

4.3.1 The questionnaire

In the discussion of the analytical hierarchy process in Chapter 2.2.7, the industry expertise and personal judgement of the stakeholders are considered to be just as important as the actual data collected in the process of complex decision-making. The AHP approach is tested in light of the research context, where the greater population would be understood to be all individuals positioned in a supply chain management role at a large South African retailer, or at a management consulting firm (with experience in supply chain strategy projects). A case study is carefully constructed, with purposive sampling to identify units of analysis that are a good representation of the greater population.

The sample selection consists of eight individuals in the researchers' network, all of whom are selected based on the following criteria to ensure that they represent the population well: the individual is experienced within the context of the South African retail industry, and he or she is currently positioned in a management role or higher (preferably in the position of director of the company); the individual is positioned at a large South African retail company, or provides management consultation directly to large South African retail companies[5]; the individual is a key decision-maker (or 'stakeholder') in a case where the business would consider a complex strategic change (such as foreign market entry); the individual has an academic and industrial background in the fields of industrial engineering, financial management, or economics.

A questionnaire is designed to collect information from this sample of individuals (see Appendix D). It is important to keep in mind that the process of data collection should not exceed the time and effort available from the stakeholders who need to provide the input. The questionnaire, slide scale, and rankings should be easy to understand, yet comprehensive enough to conduct a satisfactory study. The questionnaire constructed for the case study consists of various sections, starting with introductory questions to collect data on the individuals' experience and current position held in their company. A reference question is inserted into the questionnaire to measure the individuals' 'attitude towards risk' to ensure construct validity (in other words, to confirm that the data collected is comparable between individuals). An individual's financial risk tolerance is the measure of taking a positive attitude toward a decision where the gain is uncertain and there is a risk of experiencing a financial loss in the process. According to Grable & Lytton (1999), the impact of financial risk tolerance has received attention in scholarly research for decades, but is still considered to be of great

[5] A large company would be one with a footprint of more than 400 existing South African stores

importance as individuals and companies face ever-increasing complexity in economic decisions. Various scales are available for this specific research purpose, the most simple and widely used tool being a single question constructed by the Survey of Consumer Finances (SCF) (Grable & Lytton, 2001).

Grable & Lytton (1999) explain that the SCF single item question is easy to interpret and evaluate. It is based on the following simple question:

> Which of the following statements comes closest to the amount of financial risk that you are willing to take when you save or make investments?

a. Take substantial financial risk, expecting to earn substantial returns.
b. Take above-average financial risks, expecting to earn above-average returns.
c. Take average financial risks, expecting to earn average returns.
d. Not willing to take any financial risks.

The next section of the questionnaire consists of a simple question where the participant is asked to list and rank the top ten Sub-Saharan African countries they would choose for foreign market expansion, based on their personal experience and subject matter expertise (without doing formal research or calculations). The response to this question will be used to compare the final aggregated result of all participants, with each individual's 'best guesses'.

The final two sections of the questionnaire consist of attitude scales for pairwise comparison of variables identified, first to estimate market opportunity, and thereafter to estimate the potential risk of market entry within the scope and context of this specific study. As explained in chapter 5.2.3, slide scales are based on the 'Saaty 1-9 scale' (Saaty, 2008) with the format of the input required depicted in Figure 4-2.

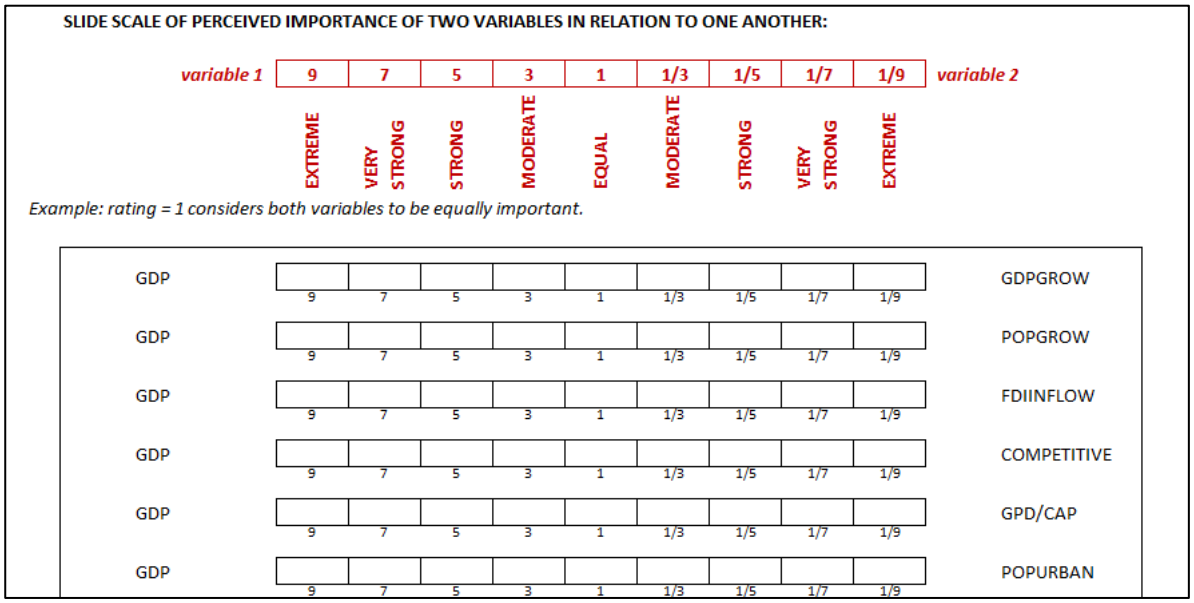

Figure 4-2: Extract from research questionnaire, showing the Saaty slide scale 1-9 (full questionnaire in Appendix D)

The purpose of pairwise comparison is to gain the research participant's personal view on the perceived importance of certain macro-economic variables compared with one another (to serve as input for the analytical hierarchy process). Questionnaire feedback will be used to test sub-model 1 by applying the analytical hierarchy process to the data collected and then solving for the Eigenvector. Further data analysis is conducted across the responses received to compare the perceived opportunity of certain Sub-Saharan Africa markets with the perceived risk of market entry.

4.3.2 Questionnaire feedback and response rate

A total of eight individuals who are considered to be subject matter experts are identified as meeting the criteria of the purposive sampling, as discussed above. From the sample of eight individuals approached, five responses have been returned. None of the respondents had any questions or required further clarification, and each questionnaire response was completed correctly without any errors, and was found to be useful for data analysis. The background information and instructions were communicated clearly, and respondents had a positive attitude towards contributing to the research process.

4.4 SECONDARY DATA FROM ANNUAL INTEGRATED REPORTS

4.4.1 Data collection for sub-model 2

For conducting a distribution network design, there are considerable constraints in collecting the required data for such simulations. Any retailer would consider this level of data to be highly sensitive information, and if a company were to agree to provide data (within the boundary of a non-disclosure agreement), the physical collection of the data would be a timeous and costly exercise due to its size and complexity, and so would be an exercise that fell outside the resources available for this study. In order to best illustrate and test the final decision-support model, an alternative approach is taken to simulate the required data points. Instead of using actual data, rounded estimate figures will serve as alias inputs. These aliases are estimated on a high level by using integrated financial reports of South African retailers that are publicly available at no cost. From the financial reports, the following variables are estimated: an average store size; an annual operating profit margin; and the total annual number of units distributed (from which an average annual unit volume per store can be calculated), all of which contribute toward calculating average revenue per store. The inbound and outbound distribution transport costs, as well as the cost of opening new stores and warehouses, vary greatly across countries due to varying levels of infrastructure; but rough estimates can be deduced from institutions such as the World Bank, which has compiled collections of data points for various countries on the cost of trading across borders, the cost of purchasing or renting property, and the cost and ease of building in each country – all of which are based on average estimates per country. The data collected is scrutinised and converted into a three-value input for the Monte Carlo simulation.

CHAPTER FIVE: MODEL DESIGN

5.1 INTRODUCTION TO MODEL DESIGN

Thus far, the thesis has addressed three of the four research questions ('What quantitative variables need to be included in a strategic decision-support model?'; 'What qualitative variables need to be included in a strategic decision-support model, and how are they to be converted into measurable variables?'; 'What tools and techniques can be applied to include all the identified qualitative and quantitative variables in a single decision-support model?') The findings to these questions are now used to address the final aim of the study as stated in Chapter 1.2: "Address a complex problem by synthesising a simple, balanced and sophisticated model at a satisfactory level of detail within the resources of time and space available".

To reduce complexity in further discussions, the main thought addressed by the thesis – "informed decision-making when considering expansion into an emerging Sub-Saharan African market, specifically in the retail sector" – will from here on be referred to simply as 'the investment decision'. The model design is described in more detail by using a hypothetical scenario of one South African retailer looking to expand into one Sub-Saharan African market, in which the retailer does not yet have a business footprint.

The model development is based on systems thinking and a top-down approach. It is important that the greater system is understood first, which means that the entire universe in which the investment decision will take place should be taken into consideration – including the larger macro-economic environment of the selected countries under consideration, the end-to-end supply chain of the retailer under investigation, and finally the financials of the retailer. This view is depicted in the simple illustration of Figure 5-1.

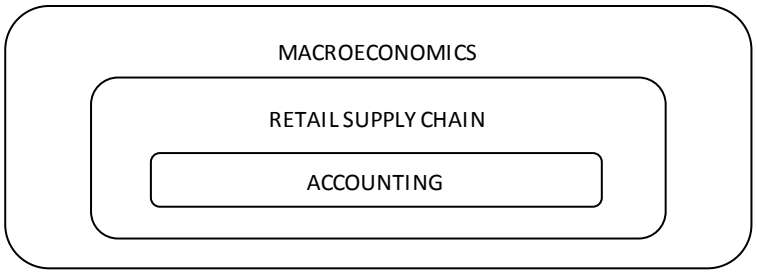

Figure 5-1: A systems hierarchy

Furthermore, it is noted that there are different hierarchical levels in the system on which the decision-making process can take place. The boundaries of the system under investigation will consist of global macro-economics, the business's financials, and the retail supply chain that links macro-economic influences to the final business case.

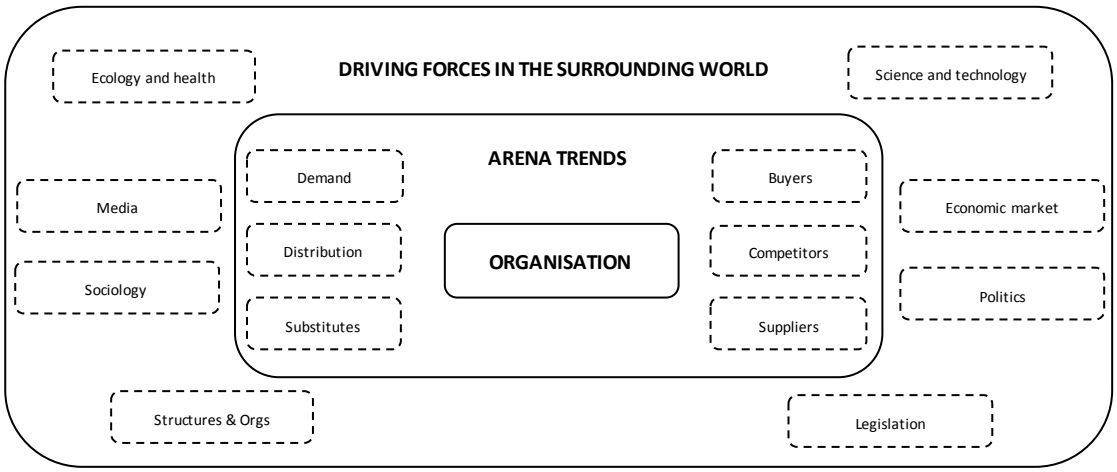

Figure 5-2: Top-down viewpoint to visualise the greater economic and supply chain system

Development of the decision-support model progresses in a top-down manner, as depicted in Figure 5-2 above, by identifying all the required input variables that would generate satisfactory outputs for addressing a typical investment decision. A combination of tools and techniques from various disciplines is applied to ensure that a holistic and quantified approach is taken, while the research addresses a mainly qualitative problem.

Chapter 5 discusses the development of the decision-support model, based on the scientific method and systems thinking approach. The tools and techniques identified in Chapter 2 are now combined to include all the qualitative and quantitative variables identified throughout the research process.

From the conclusion to Chapter 2 (Literature review), the model outputs (‘opportunity’, ‘risk’, ‘benefit’, and ‘cost’) are derived from two main disciplines: ‘opportunity’ and ‘risk’ variables are derived from the study of macro-economics, while ‘benefit’ and ‘cost’ variables are derived from the fields of supply chain management and financial management. Likewise, the model development is deconstructed into two development sprints: ‘sub-model 1’ and ‘sub-model 2’.

Development of sub-model 1 is discussed in Chapter 5.2, through application of the following tools or techniques identified in Chapter 2: a literature content analysis; secondary data analysis; and the analytical hierarchy process. The model will be validated by conducting a case study.

Similarly, the development of sub-model 2 will be discussed in Chapter 5.3, through application of the following tools or techniques identified in Chapter 2: distribution network design, Monte Carlo simulation, a strategic profit model, and benefit-cost analysis. The model will be validated by conducting sensitivity analysis.

5.2 SUB-MODEL 1: LITERATURE CONTENT ANALYSIS AND AHP

Chapter 2.3 (Literature section 2: Macro-economic variables) is based on research of qualitative macro-economic variables that are found to be important during foreign market expansion. This literature review is used as the first step in developing sub-model 1. In this step, a thorough literature 'content analysis' is conducted across a broad spectrum of literature. Definition of the phenomenon under investigation, the universe of media for sampling, and completion of the sample collection is discussed in Chapter 4.1. The conclusion in Chapter 4.1.2 presents an exhaustive list of variables that are now used as input to the next step of model development, which is the literature 'content analysis'. The definition and methodology behind the content analysis approach is addressed in Chapter 3.2.1.

Once the content analysis is completed, historical secondary data is collected to conduct a correlation analysis on each of the selected variables (discussed in Chapter 4.2).

5.2.1 Content analysis to refine variable selection

From each variable or construct included in the refined list during data collection (Chapter 4), search terms are compiled to use during the literature content analysis. These search terms are then used to investigate thoroughly whether the construct shows up in each of the media samples listed, and whether the author considers the variable as important for consideration. From this investigation, word counts and frequency analyses are conducted to validate and shortlist the variables that should be included in the final model.

Through various iterations of this content analysis approach, the exhaustive list of variables is gradually refined. Revision of the original list of 80 macro-economic variables (listed in Appendix A) is initiated by formulating a definition for each variable, determining whether the variable has secondary data available, and whether the data is provided by a reputable source. Next, the variables are grouped together in 'dimensions' that represent similar constructs. Groupings or dimensions include: market growth rate; demographics; access to services; market receptivity; diversification, competitiveness and FDI; prosperity and income distribution; demand composition; politics and governance; employment; and infrastructure. Where variables represent a similar construct, duplicates are removed from the list. Further text analysis (from the research approach discussed in Chapter 3.2.1) is done to understand whether research in the past considers the variable to be important for consideration during foreign market expansion.

The final list is reduced to 14 variables: 7 that represent market opportunity well, and 7 that reflect the risk of entering a foreign market, as shown in Table 5-1 below. (An 'opportunity' variable is defined as an indicator that would attract an investor to a foreign market, such as the market size or economic growth rate, and a 'risk' variable is defined as an indicator that would keep an investor from selecting a country for foreign investment, such as poor corporate governance, or high levels of corruption.)

Table 5-1: Refined list of 7 opportunity variables and 7 risk variables for further analysis

CODE	INDICATOR / VARIABLE	OPPORTUNITY VS RISK	SEARCH TERMS FOR LITERATURE STUDY
GDP	GDP based on PPP valuation (USD million)	OPPORTUNITY	GROSS DOMESTIC PRODUCT / GDP
GDP/CAP	GDP *per capita* (PPP valuation)	OPPORTUNITY	GDP PER CAPITA / GNI PER CAPITA
POPGROW	Population growth rate (per 1000)	OPPORTUNITY	POPULATION GROWTH
POPURBAN	Urban population	OPPORTUNITY	URBANISATION / URBAN POPULATION SIZE
COMPETITIVE	Competitiveness indicator 2010-2014 (%)	OPPORTUNITY	COMPETITIVENESS / DIVERSIFICATION / EXPORT GROWTH
FDIINFLOW	FDI inflows per historical year	OPPORTUNITY	FOREIGN DIRECT INVESTMENT / FDI INFLOW
GDPGROW	Annual real GDP growth (average over 2008-2016)	OPPORTUNITY	GDP GROWTH / ECONOMIC GROWTH
LITERACYADULT	Estimated adult literacy rate, 2010-2015 (people over 15)	RISK	ADULT LITERACY
LOGPERFINDEX	Logistics Performance Index	RISK	LOGISTICS / INFRASTRUCTURE
EASEBUSINESS	Ease of doing business ranking	RISK	EASE OF DOING BUSINESS
ECONOFREEDOM	Economic freedom	RISK	ECONOMIC FREEDOM / DEMOCRACY
GOVERNANCE	Governance	RISK	GOVERNANCE
CORRUPT	Corruption Perceptions Index 2013-2015	RISK	CORRUPTION
TRADEBORDER	Ease of trading across borders	RISK	EASE OF TRADE / CROSS BORDER TRADE

5.2.1.1 Initial review of selected variables

For the selected variables, a critical review is completed to populate Table 5-2 and Table 5-3 below as content analysis is initiated. The critical review is conducted to confirm whether a variable is well representative of either opportunity or risk, if data points are available for the selected variable and whether it is easily quantifiable or not. It is also investigated whether the variable appears in articles, text books or technical reports. The review gives an initial indication of the relevance that each variable holds (in other words, does it guide the decision based on factors like the potential market size or cost of doing business).

Table 5-2: Initial review of 'opportunity' variables

	GDP	GDP GROW	POPG ROW	FDIINFL OW	COMPETI TIVE	GDP /CAP	POP URBAN
Indicative of a perceived opportunity to invest in a market	Y	Y	Y	Y	Y	Y	Y
Historical data points are available for at least past 5 years	Y	Y	Y	Y	Y	Y	Y
Variables are easily quantifiable	Y	Y	Y	Y	Y	Y	Y
Appears in published journal articles (academic relevance)	Y	Y	Y	Y	Y	Y	Y
Appears in text books and other published literature (social relevance)	Y	Y	Y	Y	Y	Y	Y
Appears in recent technical reports (industry relevance)	Y	Y	Y	Y	Y	Y	Y
Indicator of current market size	Y				Y	Y	Y
Indicator of potential future growth of market size		Y	Y	Y	Y		
Indicator of size of available labour pool			Y				Y
Indicator of foreign interest in country	Y			Y	Y		
Indicator of individuals' budget to spend	Y	Y				Y	Y

Table 5-3: Critical review of 'risk' variables

	LITE RACY ADULT	COR RUPT	ECONO FREE DOM	GOVER NANCE	LOG PERF INDEX	TRADE BORDE R	EASE BUSI NESS
Indicative of a perceived risk to invest in a market	Y	Y	Y	Y	Y	Y	Y
Historical data points are available for at least past 5 years	Y	Y	Y	Y	Y	Y	Y
Variables are easily quantifiable	Y	Y	Y	Y	Y	Y	Y
Appears in published journal articles (academic relevance)	Y	Y	Y	Y	Y	Y	Y
Appears in textbooks and other published literature (social relevance)	Y	Y	Y	Y	Y	Y	Y
Appears in recent technical reports (industry relevance)	Y	Y	Y	Y	Y	Y	Y
Indicator of the cost of doing business		Y	Y	Y	Y	Y	Y
Indicator of distribution lead times				Y	Y	Y	Y
Reflection of political & economic instability		Y	Y	Y		Y	Y
Availability and quality of labour market	Y						
Reflects risk of poor governance		Y	Y	Y			

5.2.1.2 Word counts and frequency

Across the final sample selection, weights are assigned to each of the sources, based on the type of media (peer-reviewed articles, for instance, carry more weight than a technical report) as well as the date of publication (older publications carry less weight). The literature review was initiated in 2016 – the year used as the reference point for further calculations of the age of publications.

Table 5-4: Count of samples per media type: The total gathered, and the final sample selection

Type of media	**Max allowable age**	**Count of total samples gathered**	**Count of final sample selection**	**Code**
Peer-reviewed article <= 10 yrs	10	*23*	*18*	ART1
Peer-reviewed article 10 to 15 yrs	15	*14*	*12*	ART2
Peer-reviewed article > 15 yrs	15	*1*	*1*	ART3
Textbook <= 15 yrs	15	*11*	*6*	TXT1
Textbook > 15 yrs	50	*1*	*1*	TXT2
Developed index	2	*8*	*0*	IND1
Technical paper 'Big 4'	5	*18*	*7*	WHT1
Technical paper other	5	*9*	*0*	WHT2
TOTAL		*85*	*45*	

The number of times that each of the 7 identified 'opportunity' variables is discussed in the media sources as being an important variable to consider during an investment decision is summarised in Table 5-5 below.

Table 5-5: Frequency counts of 'opportunity' variables discussed in various sources of media

MEDIA SOURCE	GDP	GDP/ CAP	POPG ROW	POPU RBAN	COMP ETITI VE	FDIIN FLOW	GDPG ROW
Peer-reviewed article <= 10 yrs	9	10	2	1	6	12	9
Peer-reviewed article > 15 yrs	1	1	0	0	1	1	0
Peer-reviewed article 10 to 15 yrs	9	8	4	6	6	7	9
Textbook <= 15 yrs	4	5	3	3	3	5	5
Textbook > 15 yrs	1	1	1	1	1	1	1
Technical paper 'Big 4'	7	7	7	6	4	6	7
Grand total	**31**	**32**	**17**	**17**	**21**	**32**	**31**
Weighted total	**129**	**135**	**66**	**66**	**88**	**138**	**131**

The number of times each of the ten identified 'risk' variables is discussed in the media sources as being an important variable to consider during an investment decision is summarised in Table 5-6 below.

Table 5-6: Frequency counts of 'risk' variables discussed in various sources of media

MEDIA SOURCE	LITER ACYA DULT	LOGP ERFIN DEX	EASE BUSI NESS	ECON OFRE EDO M	GOVE RNAN CE	CORR UPT	TRAD EBOR DER
Peer-reviewed article <= 10 years	5	8	14	8	14	4	10
Peer-reviewed article > 15 years	0	1	0	0	1	0	0
Peer-reviewed article 10 to 15 years	3	8	8	6	7	4	9
Textbook <= 15 years	3	6	6	4	6	4	6
Textbook > 15 years	0	1	1	0	1	1	1
Technical paper 'Big 4'	6	7	7	5	6	7	6
Grand total	**17**	**31**	**36**	**23**	**35**	**20**	**32**
Weighted total	**70**	**130**	**157**	**99**	**153**	**81**	**138**

For this selection of 7 'opportunity' and 7 'risk' variables, secondary data will be collected for further analysis (expanded on in Chapter 4.2).

5.2.2 Secondary data analysis

Based on the outcomes of the literature content analysis, a total of 14 macro-economic variables are identified (summarised in Table 5-7) that are well representative of two factors that will greatly influence the investment decision: the opportunity and risk of foreign market expansion. To estimate the perceived opportunity of entering the specific market, the 7 selected variables should be representative of the market's current economic size, the projected population growth, the wealth of the population, and levels of foreign

direct investment. To estimate the perceived risk of entering a foreign market, the 7 selected variables should reflect the economic and political instability, poor infrastructure, or a high cost of doing business.

Data is collected for each identified variable, for each of the countries included in the scope of the study (Chapter 1). The methodology for data collection is discussed in Chapter 4. Sources of secondary data for a total of 14 identified variables are listed in Table 5-7 below. Secondary data analysis will consist of a compilation of statistical summaries and a statistical correlation exercise across the selected variables.

Table 5-7: Sources of secondary data for further statistical analysis

Code	Type	Variable (source)
GDP	Opportunity	GDP based on PPP valuation (African Economic Outlook, 2017)
GDP/CAP	Opportunity	GDP *per capita* (PPP valuation) (African Economic Outlook, 2017)
POPGROW	Opportunity	Population growth rate (per 1000) (African Economic Outlook, 2017)
POPURBAN	Opportunity	Urban population (African Economic Outlook, 2017)
COMPETITIVE	Opportunity	Global competitiveness ranking (World Economic Forum, 2017)
FDIINFLOW	Opportunity	FDI inflows per historical year (African Economic Outlook, 2017)
GDPGROW	Opportunity	Annual real GDP growth (average over 8 years) (African Economic Outlook, 2017)
LITERACYADULT	Risk	Estimated adult literacy rate (people over 15) (African Economic Outlook, 2017)
LOGPERFINDEX	Risk	Logistics performance index (World Bank, 2016c)
EASEBUSINESS	Risk	Ease of doing business ranking (World Bank, 2016b)
ECONOFREEDOM	Risk	Economic freedom ranking (Heritage Foundation, 2017)
GOVERNANCE	Risk	Ibrahim Index of African Governance ranking (Mo Ibrahim Foundation, 2016)
CORRUPT	Risk	Corruption Perceptions ranking (Transparency International, 2016)
TRADEBORDER	Risk	Ease of Trading Across Borders (World Bank, 2016c)

The secondary data sources referenced in Table 5-7 have been used and cited across multiple sources of literature media. (Most importantly, they have been found across academic peer-review articles, and not only in textbooks or technical papers.)

Data points for each of the variables are collected in their original format and unit of measure, as compiled in Table 7-7 in Appendix C. An attempt was made to keep the data collected as close to the date of publication as possible. (Most data collected is no older than two years from the date that research was initiated; the only data points that have an older publication date are those for which primary data collection is not conducted annually through census and surveys.)

5.2.2.1 Fill data gaps, and scale data points to a common unit of measure

The quality of the secondary data collected for each of the Sub-Saharan African countries is validated through ‘data cleansing’, which is the process of detecting inaccurate or irrelevant data points and ensuring that the data set is complete (Han, Pei & Kamber, 2011). Data gaps are filled by using weighted averages across geographical regions where data points are missing (applied only where this method would not impact heavily on the greater data set). A total of 602 data points is expected (14 variables across 43 countries).

From all the data collected, only 10 data points (1.67 per cent of the total) have no data available and need to be accounted for by using a weighted average technique.

Once all the data gaps are filled, the data sources are now standardised through a technique called 'data scaling'. This is a statistical conversion in which each variable is scaled to have its data points range on a relative scale of 1 to 10, to ensure that the data sources are now comparable with one another. Standardising the market opportunity variables will convert each data point in such a way that low ratings would represent a low level of perceived market entry opportunity. The same principle applies to the risk variables: lower ratings will reflect a low level of perceived market entry risk. Any source that does not convey the scale in this way must first be reversed by multiplying the data points by -1.

Data points are now converted to a standardised z-rating, resulting in a data set centred around 0 and with a standard deviation of 1. This is done by subtracting each data point in a set by the mean of the data and dividing by the standard deviation (Montgomery & Runger, 2010). Z-scores for all the 'opportunity' and 'risk' measures are now rescaled to fit the final selected scale of 0 to 1. This is done with a ratio formula to convert each standardised z-rating to fit the scale.

The only exception to this data conversion methodology is the 'opportunity' variable for GDP per PPP of Nigeria, which is inflated due to the country's population size. Even though Nigeria has a larger economy than South Africa, for instance, South Africa is wealthier *per capita*. Since the data point for Nigeria is such a drastic outlier, the data points must be converted to accommodate this distortion. The Nigerian data point cannot simply be excluded from the study, so an alternative route is followed by converting all the data points representing GDP to a logarithmic scale. Using a log scale is s typical approach to dealing with data that skews towards large values – in other words, if one or a few points are much larger than the majority of the data.

The final output of all the scaled data points is shown in Table 5-8 below.

5.2.2.2 Measure of uncertainty

Assuming a normal distribution, the 'opportunity' and 'risk' scores are reported alongside a standard error and 90 per cent confidence interval, which reflects the variance in the value of the source data that comprises the scores. The standard error term is calculated as the standard deviation of the rescaled source data, divided by the square root of the number of sources. Using this standard error, the 90 per cent confidence interval can be calculated while assuming a normal distribution. The central limit theory generally holds for a sample size n>=30 (Montgomery & Runger, 2010), which is true for the sample size of 43 countries.

Table 5-8: Final scaled values per country

CODE	COUNTRY	GDP	GDPGROW	POPGROW	FDIINFLOW	COMPETITIVE	GPD/CAP	POPURBAN	LITERACYADULT	CORRUPT	ECONOFREEDOM	GOVERNANCE	LOGPERFINDEX	TRADEBORDER	EASEBUSINESS
AGO	Angola	0.76	0.66	0.77	1.00	0.08	0.18	0.11	0.32	0.85	0.76	0.66	0.81	0.09	0.05
BEN	Benin	0.48	0.68	0.61	0.03	0.07	0.04	0.05	0.75	0.48	0.45	0.37	0.71	0.60	0.24
BFA	Burkina Faso	0.52	0.79	0.69	0.02	0.33	0.03	0.06	0.76	0.35	0.44	0.46	0.55	0.91	0.31
BDI	Burundi	0.33	0.57	0.80	0.00	0.29	0.00	0.01	0.13	0.81	0.62	0.62	0.66	0.40	0.23
CPV	Cabo Verde	0.22	0.54	0.24	0.01	0.10	0.17	0.00	0.09	-	0.51	0.11	0.72	0.79	0.43
CMR	Cameroon	0.64	0.66	0.57	0.07	0.11	0.07	0.14	0.27	0.69	0.66	0.56	0.85	0.02	0.16
CAF	Central African Republic	0.21	0.38	0.44	0.00	0.02	-	0.02	0.77	0.81	0.66	0.88	0.74	0.53	0.03
TCD	Chad	0.51	0.64	0.78	0.07	0.09	0.04	0.03	0.73	0.81	0.74	0.74	0.85	0.26	0.06
COM	Comoros	0.08	0.53	0.54	0.00	0.12	0.03	0.00	0.23	0.73	0.54	0.48	0.63	0.84	0.26
COG	Congo	0.51	0.63	0.60	0.17	0.08	0.16	0.03	0.21	0.81	1.00	0.60	0.73	0.12	0.09
COD	Democratic Republic of the Congo	0.62	0.77	0.75	0.19	0.09	0.01	0.34	0.24	0.79	0.53	0.72	0.73	-	0.04
DJI	Djibouti	0.21	0.73	0.26	0.01	0.11	0.09	0.01	0.29	0.60	0.81	0.54	0.76	0.60	0.42
GNQ	Equatorial Guinea	0.52	0.36	0.68	0.04	0.07	1.00	0.00	0.00	0.69	0.86	0.73	0.99	0.21	0.08
ERI	Eritrea	0.35	0.59	0.54	0.01	0.09	0.03	0.02	0.28	0.85	0.94	0.81	0.84	0.23	-
ETH	Ethiopia	0.75	1.00	0.57	0.25	0.16	0.03	0.22	0.61	0.52	0.64	0.50	0.73	0.30	0.21
GAB	Gabon	0.54	0.67	0.49	0.07	0.06	0.55	0.02	0.16	0.50	0.46	0.51	0.83	0.33	0.18
GMB	Gambia	0.22	0.61	0.77	0.00	0.03	0.03	0.01	0.52	0.69	0.61	0.54	0.80	0.81	0.31
GHA	Ghana	0.70	0.80	0.52	0.37	0.15	0.10	0.16	0.25	0.33	0.53	0.26	0.59	0.42	0.58
GIN	Guinea	0.43	0.57	0.62	0.01	0.07	0.02	0.05	0.85	0.67	0.78	0.60	0.74	0.35	0.19
GNB	Guinea-Bissau	0.19	0.63	0.55	0.00	-	0.02	0.01	0.47	0.90	0.54	0.63	0.74	0.44	0.12
CIV	Ivory Coast	0.66	0.76	0.56	0.05	0.10	0.09	0.13	0.68	0.52	0.34	0.45	0.62	0.47	0.34
KEN	Kenya	0.73	0.72	0.60	0.17	0.09	0.07	0.14	0.23	0.69	0.61	0.34	0.24	0.88	0.69
LBR	Liberia	0.23	0.68	0.57	0.06	0.15	0.01	0.02	0.63	0.46	0.74	0.49	0.83	0.05	0.11
MDG	Madagascar	0.54	0.56	0.66	0.06	0.15	0.02	0.10	0.40	0.69	0.50	0.51	0.85	0.67	0.16
MWI	Malawi	0.46	0.71	0.74	0.02	0.09	0.02	0.03	0.39	0.58	0.65	0.38	0.51	0.74	0.40
MLI	Mali	0.54	0.66	0.72	0.02	1.00	0.04	0.07	0.82	0.56	0.46	0.48	0.67	0.93	0.34
MRT	Mauritania	0.43	0.61	0.56	0.06	0.07	0.09	0.03	0.57	0.67	0.59	0.59	1.00	0.56	0.21
MUS	Mauritius	0.49	0.62	-	0.02	0.11	0.55	0.00	0.06	0.10	-	-	0.66	1.00	1.00
MOZ	Mozambique	0.53	0.80	0.65	0.43	0.11	0.02	0.10	0.48	0.67	0.71	0.45	0.58	0.86	0.37
NER	Niger	0.46	0.76	1.00	0.06	0.15	0.01	0.04	1.00	0.50	0.69	0.48	0.64	0.63	0.28
NGA	Nigeria	1.00	0.69	0.61	0.35	0.07	0.14	1.00	0.47	0.65	0.51	0.54	0.60	0.14	0.14
RWA	Rwanda	0.47	0.84	0.54	0.05	0.11	0.03	0.04	0.32	0.10	0.21	0.29	0.41	0.95	0.95
STP	Sao Tome and Principe	-	0.70	0.48	0.00	0.06	0.08	0.00	0.05	0.27	0.56	0.32	0.76	0.72	0.19
SEN	Senegal	0.55	0.68	0.72	0.04	0.09	0.05	0.07	0.52	0.29	0.54	0.31	0.76	0.65	0.30
SYC	Seychelles	0.18	0.64	0.06	0.02	0.12	0.73	-	-	0.61	0.37	0.12	0.62	0.98	0.69
SLE	Sierra Leone	0.37	0.70	0.48	0.06	0.14	0.03	0.03	0.62	0.60	0.64	0.50	0.92	0.28	0.29
ZAF	South Africa	0.95	0.49	0.15	0.20	0.05	0.36	0.38	0.01	0.29	0.36	0.17	-	0.51	0.82
SSD	South Sudan	0.46	-	0.76	-	0.13	0.03	0.03	0.83	1.00	0.56	1.00	0.62	0.19	0.02
TZA	Tanzania	0.73	0.80	0.75	0.18	0.17	0.06	0.19	0.20	0.56	0.46	0.38	0.41	0.16	0.41
TGO	Togo	0.38	0.67	0.61	0.01	0.10	0.03	0.03	0.38	0.56	0.62	0.51	0.61	0.77	0.25
UGA	Uganda	0.65	0.76	0.79	0.12	0.11	0.04	0.07	0.28	0.71	0.40	0.39	0.39	0.58	0.53
ZMB	Zambia	0.62	0.76	0.74	0.19	0.07	0.09	0.07	0.13	0.44	0.55	0.34	0.71	0.37	0.65
ZWE	Zimbabwe	0.50	0.58	0.53	0.05	0.12	0.03	0.05	0.11	0.77	0.88	0.58	0.89	0.49	0.20

5.2.2.3 Statistical correlation analysis

Statistical correlation is conducted across the scaled data to investigate the relationship between each of the variables ('opportunity' and 'risk' measures separately). This analysis technique produces a correlation (r) on a scale of -1 to +1, as shown in Figure 5-3, by using the Pearson product-moment correlation coefficient (Rodgers & Nicewander, 1988). If the results of correlation analysis between two data points return a non-zero correlation, the variables are said to be correlated (Montgomery & Runger, 2010). The values on the extremities of the scale (-1 and +1) indicate a perfectly positive or negative correlation between two data points, whereas a value close to 0 is an indication that there is no linear relationship between the values. It is important to note that correlation does not necessarily imply causation.

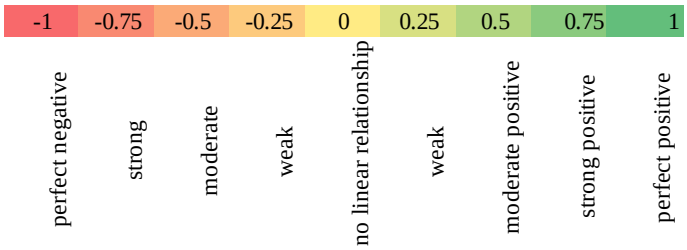

Figure 5-3: The interpretation of Pearson correlation results (Rodgers & Nicewander, 1988)

The outcomes of the statistical correlation conducted across the 7 'opportunity' variables and the 7 'risk' variables are shown in Table 5-9 and Table 5-10 respectively below.

Table 5-9: Statistical correlation of the 'opportunity' variables

	GDP	GDPGROW	POPGROW	FDIINFLOW	COMPETITIVE	GDP/CAP	POPURBAN
GDP							
GDPGROW	0.24						
POPGROW	0.20	0.08					
FDIINFLOW	0.56	0.26	0.16				
COMPETITIVE	0.07	0.10	0.17	- 0.09			
GDP/CAP	0.06	- 0.24	- 0.46	0.01	- 0.12		
POPURBAN	0.67	0.17	0.03	0.40	- 0.04	- 0.04	

Table 5-10: Statistical correlation of the 'risk' variables

	LITERACYADULT	CORRUPT	ECONOFREEDOM	GOVERNANCE	LOGPERFINDEX	TRADEBORDER	EASEBUSINESS
LITERACYADULT							
CORRUPT	0,20						
ECONOFREEDOM	0,10	0,57					
GOVERNANCE	0,40	0,82	0,62				
LOGPERFINDEX	0,15	0,28	0,46	0,45			
TRADEBORDER	- 0,03	- 0,46	- 0,48	- 0,57	- 0,33		
EASEBUSINESS	- 0,37	- 0,65	- 0,66	- 0,82	- 0,63	0,60	

From the outputs in Table 5-9, it can be deduced that the 'opportunity' variables of GDP, POPURBAN, and FDIINFLOW have a positive correlation (based on the interpretation of the Pearson correlation as conveyed in Figure 5-3). In other words, it seems that the gross domestic product (GDP) of a country has a direct influence on the size of the urban population and on the inflow of foreign direct investment (FDI) in a country (or vice versa). As is expected from the previous two statements, the FDI inflow and urban

population also have a direct positive influence on one another. Furthermore, it seems that there are no 'opportunity' variables with a moderate to strong negative correlation.

From the outputs in Table 5-10, it can be deduced that the 'risk' variables of GOVERNANCE, CORRUPT, and ECONOFREEDOM have a moderate to strong positive correlation. In other words, it seems that the level of good corporate governance in an economy is directly related to the country's levels of corruption and levels of economic freedom. The variables of EASEBUSINESS and TRADEBORDER also have a strong positive correlation. Furthermore, it can be deduced that EASEBUSINESS has a moderate to strong negative relation to the variables of ECONOFREEDOM, GOVERNANCE, CORRUPT, and LOGPERFINDEX.

It is important to note that this correlation analysis is specific to the context of this study, and should not be extrapolated or generalised without conducting further data analysis on the variables. The correlation analysis is specific to the context and scope of retail expansion, and application of these conclusions in a different context might not be accurate.

5.2.3 Analytical hierarchy process

The next step of model development, is to convert and analyse the variables that represent the 'opportunity' and 'risk' of foreign market entry, to determine a final comparative rating for 'market opportunity' and 'risk of market entry' for each Sub-Saharan country in Africa. This can be done with the application of the Analytical hierarchy process (identified and discussed in Chapter 2.2.7).

The main aim of using the analytical hierarchy process (AHP) is to generate outputs that guide the reduction of the large sample size (of 43 countries) to only a few options for further analysis and consideration. As scenario analysis can be a tedious and complex exercise, one of the goals of this research is to propose a methodology that would reduce the stakeholders' options to only a handful of scenarios that they can compare with one another and thus make an informed decision.

The AHP is a decision-making tool based on both quantitative and psychological (qualitative) principles. As discussed in the literature review in Chapter 2.2.7, AHP is helpful in simplifying complex decisions where multiple variables must be taken into consideration – especially where various fields of knowledge overlap, as the research problem in this study does (Saaty, 2008). AHP is used to present and compare selected variables with one another. Using this tool, a stakeholder can make informed decisions about which countries have a high market potential and should be taken into consideration for the next step of supply chain network design. From data collection in the format of a questionnaire, pairwise comparisons are made by subject matter experts (SMEs) to determine the perceived relative importance of variables against one another. The comparison is based on the 'fundamental scale of Saaty' (Saaty, 2008) – a numerical scale of nine deterministic points, expressed in fractions of 1/9 through 9, as shown in Figure 5-4: Example of pairwise comparison between two variables.

Variable 1										Variable 2
			x							
	9	7	5	3	1	1/3	1/5	1/7	1/9	

Figure 5-4: Example of pairwise comparison between two variables

From the above pairwise comparisons, a comparison matrix is compiled, for which the Eigenvector is solved. This output gives the weighted importance of each variable as perceived by the industry experts, which in turn is used to estimate the market attractiveness and perceived risk of foreign market entry for each country under investigation.

$$\mathcal{A} = \begin{pmatrix} 1 & a_{12} & \dots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \dots & & & \dots \\ a_{n1} & a_{n2} & \dots & 1 \end{pmatrix}$$

Figure 5-5: Depiction of Comparison Matrix

Figure 5-5 shows an example of comparison matrix (A) of experts' judgements aij based on Saaty's scale, with i, j = 1, …, n (number of variables under investigation). Each element represents the geometric average of the experts' judgements.

K.D. Goepel (2013) developed a simple Microsoft Excel tool that can be used for AHP cases where no more than ten variables are compared with one another, and used by no more than twenty decision-makers. The AHP template works under Windows OS and Microsoft Excel 2013. The workbook consists of twenty input worksheets for pair-wise comparisons, a sheet for the consolidation of all judgements, a summary sheet to display the result, a sheet with reference tables (random index, limits for geometric consistency index GCI, judgement scales), and a sheet for solving the eigenvalue problem when using the eigenvector method (EVM).

5.2.3.1 Row geometric mean method

Priorities p_i in each input sheet are calculated using the row geometric mean method (RGMM). With the pairwise NxN comparison matrix $\mathbf{A} = a_{ij}$ the following is calculated:

$$r_i = \exp\left[\frac{1}{N}\sum_{j=1}^{N}\ln(a_{ij})\right] = \left(\prod_{i=1}^{N} a_{ij}\right)^{1/N}$$

And normalize:

$$p_i = r_i ./ \sum_{i=1}^{N} r_i$$

5.2.3.2 Inconsistencies

To find the most inconsistent comparison, look for the pair *i,j* with

$$\max(\varepsilon_{ij} = a_{ij}\frac{p_j}{p_i})$$

Consistency ratios are calculated for each participant. With λ_{max} the calculated principal eigenvalue, based on the priority eigenvector derived from RGMM or derived from EVM, the consistency index CI is given as:

$$CI = \frac{(\lambda_{\max} - N)}{N-1}$$

The consistency ratio CR is calculated using

$$CR = \frac{CI}{RI}$$

The Alonso linear fit is used (Alonso & Lamata, 2006), resulting in CR:

$$CR = \frac{\lambda_{\max} - N}{2.7699N - 4.3513 - N}$$

Geometric consistency index GCI is calculated using:

$$CGI = \frac{2\sum_{i<j} \ln a_{ij} - \ln \frac{p_i}{p_j}}{(N-1)(N-2)}$$

5.2.3.3 Aggregation of individual judgements (consolidation of participants)

The consolidated decision matrix C (selected participant "0") combines all *k* participants' inputs to get the aggregated group result. The weighted geometric mean of the decision matrices elements $a_{ij(k)}$ are used, with the individual decision maker's weight w_k as given in the input sheets:

$$c_{ij} = \exp\frac{\sum_{k=1}^{N} w_k \ln a_{ij(k)}}{\sum_{k=1}^{N} w_k}$$

5.2.3.4 AHP consensus indicator

AHP consensus is calculated in the summary sheet based on the RGMM results of all inputs using Shannon alpha and beta entropy. The consensus indicator ranges from 0% (no consensus between decisions makers) to 100% (full consensus between decision makers).

AHP consensus indicator S* is calculated as:

$$S^* = \left[M - \exp(H_{\alpha\min})/\exp(H_{\gamma\max})\right]/\left[1 - \exp(H_{\alpha\min})/\exp(H_{\gamma\max})\right]$$

with $$M = 1/\exp(H_\beta)$$

$H_{\alpha,\beta,\gamma}$ is the α,β,γ Shannon entropy for the priorities of all *K* decision-makers.

Shannon alpha entropy $$H_\alpha = \frac{1}{K}\sum_{j=1}^{K}\sum_{i=1}^{N} - p_{ij} \ln p_{ij}$$

Shannon gamma entropy $$H_\gamma = \sum_{j=1}^{K} - \bar{p}_j \ln \bar{p}_j$$

with $$\bar{p}_j = \frac{1}{N}\sum_{i=1}^{N} p_{ij}$$

Shannon beta entropy $$H_\beta = H_\gamma - H_\alpha$$

The AHP scale is adjusted of the maximum score c_{max} and

$$H_{\alpha\min} = -\frac{c_{\max}}{N + c_{\max} - 1} \ln\left(\frac{c_{\max}}{N + c_{\max} - 1}\right) - (N-1)\frac{1}{N + c_{\max} - 1} \ln \frac{1}{N + c_{\max} - 1}$$

$$H_{\gamma\max} = (N-K)\left(-\frac{1}{c_{\max} + N - 1}\right)\ln\left(\frac{1}{c_{\max} + N - 1}\right) - \left(\frac{K + c_{\max} - 1}{N + c_{\max} - 1}\right)\ln\left(\frac{1}{K} \cdot \frac{K + c_{\max} - 1}{N + c_{\max} - 1}\right)$$

With *N* number of criteria, and *K* number of decision-makers.

The AHP for the synthesised model will be tested in Chapter 4.4 by the collection of primary data from industry experts, based on a case study.

5.2.4 Validation of sub-model 1: a case study

Validation of sub-model 1 is done in the format of a case study. A very intentional sample of subject matter experts (SMEs) is selected to take part in the case study. (An SME is an individual who would typically be considered a stakeholder in a scenario where a supply chain investment decision is made.) The data collection process followed to collect required inputs for validation of sub-model 1 is discussed in Chapter 4.3.

5.2.4.1 Data analysis on questionnaire feedback

A total of eight individuals who are considered to be subject matter experts are identified as meeting the criteria of the purposive sampling, as discussed above. From the sample of eight individuals approached, five responses have been returned. Hereafter, data analysis will commence on the primary data collected from the questionnaires.

Abbreviations that will be used during the data analysis discussion are listed in Table 5-11 below.

Table 5-11: Abbreviations for interpreting the AHP data analysis

Abbreviation	Description
SCF	Survey of Consumer Finances
n	Number of criteria
N	Number of participants
alpha (α)	The threshold for acceptance of inconsistency
RGMM	Row Geometric Mean Method
CR	Consistency ratio
GCI	Geometric consistency index
GDP	GDP based on PPP valuation
GDPGROW	Annual real GDP growth (average over past 8 years)
POPGROW	Population growth (%)
FDIINFLOW	FDI inflow (USD million)
COMPETITIVE	Global competitiveness effect (%)
GDP/CAP	GDP *per capita* (PPP valuation, USD)
POPURBAN	Total urban population (thousands)
LITERACYADULT	Estimated adult literacy rate (%) (age >15)
CORRUPT	Corruption perception index (CPI) (0 to 10)
ECONOFREEDOM	Economic freedom score (0 to 100)
GOVERNANCE	Mo Ibrahim Index of African Governance (0 to 100)
LOGPERFINDEX	Logistics performance index (1 to 5)
TRADEBORDER	Distance to frontier: Trade across border (0 to 100)
EASEBUSINESS	Ease of doing business ranking (1 to 190)

Table 5-12 summarises the demographics of the respondents, and the result from the Survey of consumer finances (SCF) single question which estimates each individuals' risk tolerance. The participants are a mix of managers and directors in corporate and consulting roles in the retail industry. All the participants perceive themselves as individuals who take average to above average financial risk when considering an investment option.

Table 5-12: Research participants' demographics and financial risk tolerance

Participant demographics			Survey of consumer finances (SCF) Single Question	
PARTICIPANT #	**COMPANY TYPE**	**POSITION**	**SCF**	**RISK TOLERANCE DESCRIPTION**
1	Retailer	Director	C	Take average financial risk, expecting to earn average returns
2	Consulting	Manager	B	Take above-average financial risk, expecting to earn above-average returns
3	Consulting	Director	B	Take above-average financial risk, expecting to earn above-average returns
4	Consulting	Senior Manager	C	Take average financial risk, expecting to earn average returns
5	Retailer	Managing Director	B	Take above-average financial risk, expecting to earn above-average returns

The Analytical Hierarchy Process is completed by using the participant feedback, with an end goal of giving a market attractiveness ranking to each of the Sub-Saharan African countries in scope (ranking of top ten countries with the highest 'opportunity' ratings as well as top ten countries with lowest 'risk' ratings).

Table 5-13 and Table 5-14 below summarise the final weights assigned to each variable per individual, based on the row geometric mean method (RGMM). The tables show the output for individuals one through five, and the output of the combined results. The additional columns to the right show how results of an average value (calculated for each variable across the five participants' outputs) differ to the combined output result calculated by using the RGMM approach.

Table 5-13: Weighted outputs for each 'opportunity' variable by using the row geometric mean method (RGMM)

'OPPORTUNITY' VARIABLE	Individual Participant Results					Combined Results (RGMM)	Ranking (based on combined)	*Average*	*Standard deviation*
	1	2	3	4	5				
GDP	41%	7%	5%	6%	17%	13.0%	4	*15%*	*15%*
GDPGROW	18%	20%	18%	36%	13%	24.0%	1	*21%*	*9%*
POPGROW	16%	4%	8%	13%	16%	12.2%	5	*11%*	*5%*
FDIINFLOW	11%	13%	17%	20%	4%	13.4%	3	*13%*	*6%*
COMPETITIVE	6%	6%	29%	7%	4%	9.7%	6	*11%*	*10%*
GDP/CAP	4%	34%	19%	16%	41%	21.6%	2	*23%*	*14%*
POPURBAN	3%	17%	4%	3%	6%	6.1%	7	*7%*	*6%*

Table 5-14: Weighted outputs for each 'risk' variable by using the row geometric mean method (RGMM)

'RISK' VARIABLE	Individual Participant Results					Combined Results (RGMM)	Ranking (based on combined)	*Average*	*Standard deviation*
	1	2	3	4	5				
LITERACYADULT	36%	16%	19%	4%	3%	12.3%	5	*16%*	*14%*
CORRUPT	10%	12%	24%	11%	42%	19.2%	2	*20%*	*14%*
ECONOFREEDOM	17%	16%	13%	16%	4%	13.8%	4	*13%*	*5%*
GOVERNANCE	10%	12%	4%	19%	7%	10.7%	7	*10%*	*6%*
LOGPERFINDEX	12%	9%	5%	20%	21%	14.1%	3	*13%*	*7%*
TRADEBORDER	9%	13%	7%	11%	8%	10.7%	6	*9%*	*2%*
EASEBUSINESS	7%	24%	27%	20%	15%	19.3%	1	*18%*	*8%*

Final results for the aggregate weighted importance of the 'opportunity' and 'risk' variables are shown in

Table 5-15 and Table 5-16, derived by solving the Eigenvector as explained in the literature review (Chapter 2.2.7).

Table 5-15: Final result of aggregate weighted 'opportunity' variables

Criteria	Weight	Rank
GDP	12.9527%	4
GDPGROW	23.9534%	1
POPGROW	12.2215%	5
FDIINFLOW	13.4398%	3
COMPETITIVE	9.7316%	6
GDP/CAP	21.5954%	2
POPURBAN	6.1055%	7

From the results in Table 5-15, it is concluded that the participants in the case study consider the variable of GDP growth as the most important variable to take into consideration during foreign market expansion. GDP growth is thus assigned the greatest weight (of 24 per cent) for further calculation of the market attractiveness of the various Sub-Saharan African countries. The second-highest weight is assigned to the variable of GDP *per capita* at 22 per cent, then the variable for FDI inflow at 13 per cent.

Table 5-16: Final result of aggregate weighted risk variables

Criteria	Weight	Rank
LITERACYADULT	12.3391%	5
CORRUPT	19.1676%	2
ECONOFREEDOM	13.7985%	4
GOVERNANCE	10.6509%	7
LOGPERFINDEX	14.0559%	3
TRADEBORDER	10.7364%	6
EASEBUSINESS	19.2516%	1

From the results in Table 5-16, it is concluded that the participants consider the variable representing the 'ease of doing business' as the most important variable that indicates the potential risk of foreign market entry (with a weight of 19.3 per cent). The second-highest weight is assigned to the 'risk' variable that indicate prevalence of corruption at 19.2 per cent, then the variable that measures the logistics performance (at 14 per cent).

Using these weighted variables as inputs, the results are tested against the macro-economic secondary data collected for each of the variables (discussed in Chapter 4: Data collection). Table 5-17**Error! Reference source not found.** and Table 5-18 display the final outputs of the case study – the first table shows the top ten countries as ranked by the weighted variables for opportunity of foreign market entry, and the second table shows the top ten countries ranked by the perceived risk of foreign market entry.

Table 5-17: Final output of aggregate results for ranking countries by highest perceived opportunity for consideration of foreign market expansion

Country code	Country name	Opportunity ranking
AGO	Angola	1
NGA	Nigeria	2
ETH	Ethiopia	3
GNQ	Equatorial Guinea	4
TZA	Tanzania	5
GHA	Ghana	6
MLI	Mali	7
GAB	Gabon	8
MOZ	Mozambique	9
COD	Democratic Republic of the Congo	10

Figure 5-6: Top 5 countries with highest 'opportunity' ranking

Table 5-18: Final output of aggregate results for ranking countries by lowest perceived risk for consideration of foreign market expansion

Country code	Country name	Risk ranking
CPV	Cabo Verde	1
STP	Sao Tome and Principe	2
TZA	Tanzania	3
GAB	Gabon	4
MUS	Mauritius	5
GHA	Ghana	6
NGA	Nigeria	7
COD	Democratic Republic of the Congo	8
LBR	Liberia	9
RWA	Rwanda	10

Figure 5-7: Top 5 countries with lowest 'risk' ranking

Figure 5-8 below is a visualisation of each country, based on its final ‘opportunity’ and ‘risk’ ratings. Countries with the highest market attractiveness are those with a high ‘opportunity’ rating and low ‘risk’ rating – such as Tanzania (‘TZA’) and Nigeria (‘NGA’). South Africa (‘ZAF’) is not considered as an investment option, but is included in the graph as a reference data point.

An informed decision can now be made to select specific countries for further supply chain network analysis. This study started by investigating a sample of 43 countries. This sample size can now be reduced to a refined list of two or three countries to consider for further analysis. The reason for reducing the sample size so drastically is to make further analysis feasible within the time and resources that a retailer would typically have to make a strategic decision like the one addressed in the research problem. Conducting a distribution network design across all 43 countries would not only be time-consuming and costly, but would also be a complex exercise. One of the aims of this thesis is to present a methodology that reduces complexity in the decision-making process.

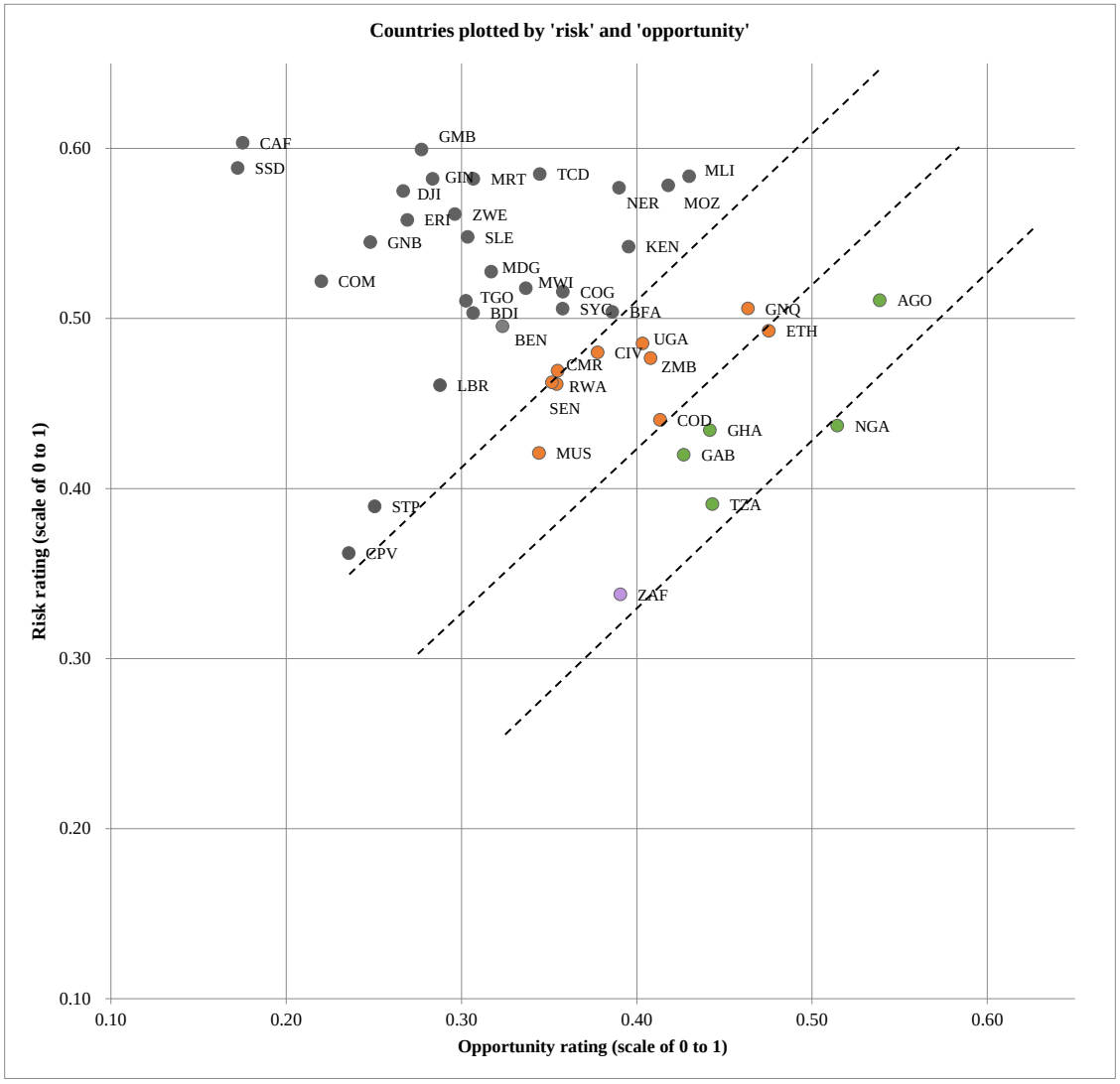

Figure 5-8: Scatter diagram of countries' 'opportunity' and 'risk' ratings

The graph can be interpreted by considering the country with the highest ‘opportunity’ rating and lowest ‘risk’ rating to be the most attractive. Therefore, a country that is positioned to the bottom right corner of the graph is considered as having high market attractiveness.

From the outputs in Figure 5-8, the country with the highest market attractiveness is Nigeria, with an ‘opportunity’ rating of 0.44 and a ‘risk’ rating of 0.39. Apart from Nigeria, another five countries are identified as being favourable for market expansion, with an ‘opportunity’ rating greater than 0.51 and a ‘risk’ rating lower than 0.52. These five countries are Tanzania (‘TZA’), Angola (‘AGO’), Gabon (‘GAB’), Ghana (‘GHA’), and Ethiopia (‘ETH’).

The outcomes of the case study conclude that there are six Sub-Saharan African countries (from a total sample size of 43) that simultaneously give a high ‘opportunity’ rating and a low ‘risk’ rating. Stakeholders may select these six countries for further investigation in the form of a distribution network design (DND). If time and resources allow for it, DND simulations can be conducted across the total of fifteen countries that appear in the lists of high ‘opportunity’ and low ‘risk’ ratings.

From the results collected (as listed in Appendix E), outputs are now compared in various ways to identify patterns and correlations between individual industry expertise, and the final aggregate results are calculated by using the AHP approach.

5.2.5 Validation of the results

The AHP approach is based on varying opinions of decision-makers, which could raise questions about the level of accuracy of the model, the variation throughout the process and the consistency of outcomes. Various experimental approaches are taken to validate the model design proposed in this thesis. The analysis tests how well the AHP fares as a choice decision-support model in a real-world application, specific to the South African retail industry expanding into Sub-Saharan Africa. Model validation for multi-criteria decision problems (MCDP) is a difficult exercise, and consistency of the results must be ensured by following a process where variation is managed throughout the analysis. Furthermore, the model outputs must be compared with real-world findings, as this is one way of proving that the predicted theory matches known results (Whitaker, 2007).

The usefulness of the model as a decision-support tool is tested throughout the process by calculating and managing the Consistency Ratio (CR). The CR is an indicator of the consistency with which an individual is completing the pairwise comparisons (as part of the case study questionnaire). Furthermore, the standard deviation of the results is scrutinized for each individual, and then compared with the results from the entire sample of decision-makers.

In addition to the approach mentioned above, the case study that has been conducted is tested once more – this time by using historical data from two years prior to the primary case study. For model validation in this thesis, data from 2014 is collected. The model can now be evaluated by comparing the 2014 test case's results with actual Sub-Saharan African retail trends over the time period of 2015 to 2016.

The various approaches to result validation are discussed below.

5.2.5.1 Consistency measures and sample size

One of the elements critical to the success of AHP application is the calculation of consistency ratios while individuals are making pairwise comparisons (matrix consistency is the measure of linear independence between variables, as defined by Franek & Kresta (2014)). It is thus important to apply the correct judgment scale for the specific AHP context. The various judgment scales that could be used include linear, power, root square, geometric, inverse linear, asymptotical, balanced and logarithmic scales. The scale used in this thesis is the linear (Saaty) judgment scale, which remains the most popular option, with a moderate sensitivity to consistency measures (Franek & Kresta, 2014). Furthermore, it is more accurate for an individual to make a decision between two alternatives at a time (instead of comparing all alternatives simultaneously), which makes the use of pairwise comparison a simplified method of decision-making which allows for consistency checks (Ishizaka & Labib, 2011).

As the sample size of decision-makers increase, the overall consistency ratio improves. In other words, the standard deviation in the results reduces as the number of decision-makers increases, which is measured by the variable alpha (α). An explanation of the design of AHP is given in Chapter 4.3.6, from which it is clear that the consistency indicators are the most critical requirement to keep in mind when interpreting the results of the pairwise comparisons (Goepel, 2013). Alpha is the threshold for acceptance of inconsistency, and a value between 0.1 and 0.2 is recommended for this measure (Saaty, 2008).

For both 'opportunity' and 'risk' AHP calculations in this exercise, an initial value for alpha is selected as α = 0.15. Based on the suggestion that the consistency ratio (CR) should not exceed the value of CR = 0.1, it is possible to test whether the choice of alpha is reasonable. Table 5-19 below shows the CR values for each of the research participants. For a linear AHP 1-9 scale, there is a median value of CR = 0.11 for the opportunity outputs and 80th percentile is at a CR = 0.24. The choice of α = 0.15 for the 'opportunity' calculations is thus too strict for the practical application of this research and would result in revision of majority of the questionnaires (in other words, the questionnaires would have to be returned to participants to adjust pairwise selections to give a more consistent output). The level of alpha is adjusted to 0.2 (which is a higher tolerance for inconsistency, but still within the acceptable values as recommended by Saaty). For the 'risk' calculations, there is a median value of CR = 0.10 and the 80th percentile is at a CR = 0.18. The choice of α = 0.15 for the 'risk' calculations is thus sufficient for application in this study, and the level of alpha gives confidence in the results.

Table 5-19: Individual CR for 'opportunity' and 'risk' slide scales

PARTICIPANT	n	N	'OPPORTUNITY' CONSISTENCY RATIO	'RISK' CONSISTENCY RATIO
1	7	1	23%	8%
2	7	1	6%	16%
3	7	1	11%	8%
4	7	1	10%	10%
5	7	1	28%	27%
		Median:	*0.11*	*0.10*
		80^{th} percentile:	*0.24*	*0.18*

Table 5-19 (summarising each individual's consistency ratio for the 'opportunity' and 'risk' slide scales) can now be compared with the final aggregated results as in Table 5-20 (with n = number of criteria, and N = number of participants).

Table 5-20 below summarises the statistics compiled during AHP conducted across 7 variables (n = 7) and a sample of five participants (N = 5).

Table 5-20: Aggregate results when a combined view is taken using AHP

	n	N	CONSENSUS	ALPHA	GCI	CR
'OPPORTUNITY'	7	5	57.0%	0.15	0.12	3.3%
'RISK'	7	5	66.2%	0.20	0.06	1.6%

An input consensus of 57 per cent is reached among the participants across the 'opportunity' variables and 66 per cent across the 'risk' variables (the consensus indicator ranges from 0 per cent where there is no consensus between decisions makers to 100 per cent if there is full consensus between decision makers). These results give a clear indication of how the consistency ratio has improved by rather taking a combined AHP view (as opposed to taking an average value over the individual results). For the 'opportunity' variables, the average CR over the individual outputs result in CR = 0.16, whereas the CR for the combined results using AHP gives a much more desirable CR = 0.03. Similarly, the average CR across individual outputs of the risk variables result in CR = 0.14, whereas the CR for the combined results using AHP gives a value of CR = 0.016. From these results, it is evident that the use of the balanced scale improves consistency.

5.2.5.2 SME best guess compared to model results

The case study questionnaire constructed for SME inputs contains a question that tests the individual's "best guess" of countries in which to expand business footprint. The response to this question is based solely on the SMEs own operational and industrial experience, without doing any statistical analysis or calculations. This question is used as a reference point for output validation. Each of the SMEs that partook in the case study has experience in the South African retail industry and is familiar with strategic supply chain decisions to expand footprint to African countries (outside of the BLNS region). In other words, each of these decision-makers is based at a retail company (or is directly consulting to such a retailer) and already knows which countries have been successful for African expansion some years prior to the publication of this research. As our questionnaire is based on a hypothetical scenario where a retailer in its current state only has stores opened in South Africa and the BLNS countries, the response to the "best guess" question is a good point of reference for outcome validation.

Ishizaka *et al*. conducted a similar experiment to evaluate how consistently AHP replicates rankings of decision variables (Ishizaka, Balkenborg, & Kaplan, 2011). The experiment was conducted at various points of the process (having the decision-makers rank their best guess before, during and after the formal AHP calculation), and it was concluded that while the rankings vary widely across the individuals, the AHP model consistently produced the same results per individual.

Applying this validation approach, the first comparative analysis is conducted on the 2016 case study and AHP conducted with the 2016 historical data points. Table 5-21 below gives a description of each scenario investigated, while a summary of the statistical comparison is given in Table 5-22.

Table 5-21: Comparisons completed and a description of each

Comparison	Description
1. OPP & RISK TOP 5	Number of times the individual's result for top 5 'opportunity' also shows up in top 5 'risk'
2. OPP & RISK TOP 10	Number of times the individual's result for top 10 'opportunity' also shows up in top 10 'risk'
3. GUESS & OPP TOP 5	Number of times the individual's result for top 5 countries guessed (based on industry experience) also shows up in top 5 'opportunity'
4. GUESS & OPP TOP 10	Number of times the individual's result for top 10 countries guessed (based on industry experience) also shows up in top 10 'opportunity'
5. GUESS & RISK TOP 5	Number of times the individual's result for top 5 countries guessed (based on industry experience) also shows up in top 5 'risk'
6. GUESS & RISK TOP 10	Number of times the individual's result for top 10 countries guessed (based on industry experience) also shows up in top 10 'risk'
7. GUESS & FINAL OPP TOP 5	Number of times the individual's result for top 5 countries guessed (based on industry experience) also shows up in aggregate top 5 'opportunity'
8. GUESS & FINAL OPP TOP 10	Number of times the individual's result for top 10 countries guessed (based on industry experience) also shows up in aggregate top 10 'opportunity'
9. GUESS & FINAL RISK TOP 5	Number of times the individual's result for top 5 countries guessed (based on industry experience) also shows up in aggregate top 5 'risk'
10. GUESS & FINAL RISK TOP 10	Number of times the individual's result for top 10 countries guessed (based on industry experience) also shows up in aggregate top 10 'risk'

Table 5-22: Various comparisons of individual and aggregate outputs

PARTICIPANT #	1. OPP & RISK TOP 5	2. OPP & RISK TOP 10	3. GUESS & OPP TOP 5	4. GUESS & OPP TOP 10	5. GUESS & RISK TOP 5	6. GUESS & RISK TOP 10	7. GUESS & FINAL OPP TOP 5	8. GUESS & FINAL OPP TOP 10	9. GUESS & FINAL RISK TOP 5	10. GUESS & FINAL RISK TOP 10
1	10%	40%	20%	70%	0%	40%	20%	60%	0%	40%
2	10%	60%	10%	50%	0%	40%	20%	50%	0%	40%
3	0%	40%	20%	50%	0%	30%	20%	60%	0%	50%
4	10%	50%	20%	60%	10%	50%	30%	50%	10%	50%
5	0%	40%	20%	50%	0%	30%	20%	50%	0%	40%

Table 5-22 shows the correlation between i) each individual's results of country selections, ii) the combined results and iii) the individual's initial best guess. There is a high correlation within the top ten selections of individuals, and the combined output. (This confirms the consensus indicators for 'opportunity' and 'risk' being between 50 and 70 per cent across the participant inputs.) There is a particularly high correlation between the individuals' best guess of which country they would consider for foreign market expansion (based on their industry experience, and without doing research or calculations), and the top ten country outputs based on 'opportunity' variables. This is a good indicator that the individuals are well informed of economic activity in Sub-Saharan countries, and are rightfully considered to be experts in the industry.

The second validation analysis is conducted on the scenario where historical data from 2014 is used, but this time comparing the results with the "best guess" of the SMEs feedback as collected in 2016. The model prediction of the top 10 countries with highest attractiveness can now be confirmed (or disproved) by the

feedback provided by individuals who had first-hand experience of retailers expanding footprint in Sub-Saharan Africa for the period of 2014 to 2016. Table 5-23 below compares the country ranking outputs from the AHP applied to both 2014 and 2016 macroeconomic data collected, indicating to what extent the rankings changed.

Table 5-23: Model outputs for AHP as applied to 2014 and 2016 historical data

CODE	COUNTRY	2014	2016	CHANGE
NGA	Nigeria	6	1	5
ZAF	South Africa	control		
TZA	Tanzania	8	2	6
AGO	Angola	21	3	**18**
GHA	Ghana	3	4	-1
GAB	Gabon	5	5	0
ETH	Ethiopia	11	6	5
COD	Democratic Republic of the Congo	30	7	**23**
GNQ	Equatorial Guinea	17	8	9
ZMB	Zambia	7	9	-2
MUS	Mauritius	1	10	**-9**
UGA	Uganda	16	11	5
CIV	Ivory Coast	13	12	1
RWA	Rwanda	4	13	**-9**
SEN	Senegal	14	14	0
CMR	Cameroon	18	15	3
BFA	Burkina Faso	23	16	7
CPV	Cabo Verde	9	17	**-8**
STP	Sao Tome and Principe	19	18	1
KEN	Kenya	12	19	-7
SYC	Seychelles	2	20	**-18**
MLI	Mali	20	21	-1
COG	Congo	28	22	6
MOZ	Mozambique	10	23	**-13**

In addition to the SME opinions as to which countries are favourable for market entry, a list is compiled of the largest retailers in Sub-Saharan Africa, and the countries in which they had stores operating at any point during the period of 2014 to 2016.

			1	2	3	4	5	6	7	8	9	10	11	13	19	23	26	28	30	33
	2016 Rank:		6	8	21	3	5	11	30	17	7	1	16	4	12	10	22	32	27	36
	2014 Rank:		6	6	4	7	0	0	1	0	9	3	7	1	7	9	2	1	1	4
	Retailer count:		Nigeria	Tanzania	Angola	Ghana	Gabon	Ethiopia	DRC	Equatorial Guinea	Zambia	Mauritius	Uganda	Rwanda	Kenya	Mozambique	Malawi	Burundi	Madagascar	Zimbabwe
RETAILER	Host country	Country count																		
Massmart Holdings	South Africa	7	Y	Y		Y							Y		Y	Y	Y			
Shoprite Holdings	South Africa	9	Y	Y	Y	Y			Y		Y		Y			Y			Y	
Woolworths	South Africa	8	Y	Y		Y					Y	Y	Y		Y	Y				
Truworths International	South Africa	7	Y		Y	Y					Y	Y			Y					Y
Pep Africa (Steinhoff)	South Africa	5	Y		Y								Y			Y	Y			
Mr Price	South Africa	6	Y	Y		Y					Y		Y		Y					
Nakumatt	Kenya	5		Y									Y	Y	Y			Y		
Jet	South Africa	4				Y					Y					Y				Y
Edgars	South Africa	4				Y					Y					Y				Y
Pick n Pay Stores	South Africa	4									Y	Y				Y				Y
Choppies	Botswana	4		Y							Y				Y	Y				

Figure 5-9: Actual retailers' footprint in Sub-Saharan African countries (2014 to 2016)

Deductions can now be made as to how accurately the 2014 results reflect the expert predictions of the decision-makers by scrutinising the three collections of data: i) the SME input (as part of 2016 primary data collection), ii) the actual store footprint for the years 2014 to 2016 (displayed in Figure 5-9 above), and iii) the difference between the 2014 and 2016 macroeconomic data points collected.

Figure 5-10 below is a colour-coded comparison of the outputs[6], with the findings discussed below.

Country	Code	Colour key
Nigeria	NGA	
Mozambique	MOZ	
Zambia	ZMB	
Zimbabwe	ZWE	
Angola	AGO	
Kenya	KEN	
Ghana	GHA	
Tanzania	TZA	

2016 results: SMEs "best quess" results					
RANK	1	2	3	4	5
1	ZMB	NGA	ZMB	NGA	ZMB
2	AGO	GHA	MOZ	AGO	NGA
3	MOZ	KEN	AGO	COD	KEN
4	NGA	MWI	ZWE	COG	AGO
5	KEN	SEN	NGA	TZA	MOZ
6	ETH	RWA	TZA	KEN	GHA
7	MUS	COD	KEN	MDG	ZWE
8	GHA	UGA	GHA	UGA	TZA
9	ZWE	TZA	RWA	GHA	UGA
10	UGA	AGO	COD	RWA	RWA
12					
19					
21					
23					
33					
36					

AHP model results	
2014	2016
MUS	NGA
SYC	TZA
GHA	AGO
RWA	GHA
GAB	GAB
NGA	ETH
ZMB	COD
TZA	GNQ
CPV	ZMB
MOZ	MUS
KEN	CIV
STP	KEN
AGO	MLI
BFA	MOZ
COM	ZWE
ZWE	GNB

Figure 5-10: Colour-coded comparison of SME "best guess" results and model outputs for 2014 and 2016

From Figure 5-10, some countries show a clear correlation between the 2014 AHP model results, and the SME opinion. The comparisons drawn between these two sets of results are important for model validation. (The set of results for the 2016 outputs can only be validated a year or two after publication, to understand whether its estimates were indeed an accurate prediction.)

[6] For the sake of displaying the data, not all the countries ranking lower than the top 10 are all included in the list. Rankings 11 through 43 are thus not listed in the same increment as 1 to 10.

Table 5-24: Correlation between the results of the SME best guess and model outputs (for selected countries)

A high correlation is evident between:	NGA	MOZ	ZMB	ZWE	AGO	KEN	GHA	TZA	RWA
SME estimate and 2014 model outputs	Y	Y	Y			Y	Y	Y	Y
SME estimate and both 2014 and 2016 model outputs	Y		Y				Y	Y	
SME estimate and 2016 model outputs, but not 2014					Y				

Based on the results in Table 5-24 above, the correlation findings for some of the countries are discussed below (countries are grouped by relevance of the findings).

Nigeria, Zambia, Ghana, and Tanzania: The SME estimations correlate very well with both the 2014 and 2016 data sets, confirming the validity of the model and consistency in the various findings. Even though historical data ranked Nigeria in 6th place for market attractiveness in 2014, SMEs rightfully 'guesstimated' it as a top candidate during the 2016 period (as is proven by the results from 2014 data points which rank Nigeria as the best candidate for market expansion, out-performing South Africa). Both Woolworths and Truworths had a business footprint in Nigeria, but closed down their stores during the period of data collection. Majority of the SMEs rated Zambia as the number 1 country for market expansion. Even though Zambia does not reach 1st place in either 2014 or 2016 historical data, it is consistently in the top 10 countries for both years.

Mozambique, Kenya, Rwanda: SME estimations correlate very well with the 2014 model results, confirming the validity of the model. Even though Mozambique was seen as a good opportunity for expansion in the past (as indicated by majority of the SMEs, which correlates well with 2014 data), its economic variables have changed over the course of 2014 to 2016 – now falling outside of the top 20 countries. Kenya was in 12th position per the 2014 results – correlating well with all 5 SMEs estimating it as a top 10 candidate for expansion. 2016 data, however, shows that Kenya's attractiveness dropped by 7 positions.

Angola: Angola improved by 18 spots (from 21st to 3rd) between 2014 and 2016 model outputs. All the SMEs estimated Angola to be a good candidate for market expansion, which does not correlate well with 2014 data, but very well with 2016 data. From the listed major retailers, Woolworths, Shoprite and Steinhoff are the only ones to make the move into Angola at the time of data collection.

Democratic Republic of the Congo (DRC): None of the SMEs guesstimated that DRC would be a good candidate for expansion (which correlates well with 2014 data). DRC does, however, improve by 23 spots to 7th place in the 2016 model outputs.

Zimbabwe: Zimbabwe is an outlier in both data sets, being the only country with poor correlation between SME estimations and the 2014 data points. 3 of the 5 SMEs rated Zimbabwe in the top 10 countries for

expansion. This does not correlate well with 2014 or 2016 data, which ranks Zimbabwe outside the top 30 countries. A reason for this could be the fact that Zimbabwe was seen as an attractive opportunity in the past (due to its geographic proximity to South Africa). Though some retailers do have stores operating in Zimbabwe, many large retailers (including Woolworths, Shoprite and Massmart) have closed down all their outlets in the country.

Mauritius, Gabon: Both these countries rank high on the 2014 and 2016 model results, yet none of the experts "guesstimated" that these countries would have a high market attractiveness. There is no evidence in the current retailer footprint that major retailers are expanding into Ethiopia and Gabon, though some do have existing footprint in Mauritius.

By comparing model predictions with expert opinion and real retail footprint, the modelling approach is confirmed as being consistent (as is evident in results from majority of the Sub-Saharan African countries under investigation). The outlier results (countries such as Zimbabwe, Mauritius and Gabon) should be investigated further, to understand why the model would predict these countries as having an attractiveness rating that differs to real-world findings. The case study gives insight into the workings of the AHP sub-model, and the approach is confirmed to be a simple and satisfactory means of modelling the 'opportunity' and 'risk' variables of countries by using expert judgement as data input.

5.2.6 Conclusion to sub-model 1

This chapter presented a systematic approach to the development of sub-model 1, by combining the following tools and techniques: a literature content analysis; secondary data analysis; and the analytical hierarchy process.

Through an iterative process of content analysis, a set of 14 variables are identified: 7 that represent market opportunity well, and 7 that reflect the risk of entering a foreign market. Analysis is conducted on the selected 'opportunity' and 'risk' variables through application of the Analytical Hierarchy Process. The 7 'opportunity' variables are listed (in no particular order) as being gross domestic product (GDP), the annual growth rate of GDP, the annual growth rate of the size of the population, the size of foreign direct investment, the perceived competitiveness of the country, GDP *per capita*, and the size of the population in urban regions. The 7 'risk' variables are listed (in no particular order) as being adult literacy rate, ranking on the Corruption Perceptions Index, degree of economic freedom, degree of corporate governance, ranking on the Logistics Performance Index, distance to frontier for trading across borders, and ranking on the Ease of Doing Business Index.

By assigning an 'opportunity' and 'risk' rating to each country, an informed decision can be made about which countries should be further investigated, based on having a combination of the highest market attractiveness and lowest perceived risk of investment. From these findings, the sample size of countries

under consideration is reduced drastically with the aim of selecting only a handful (two or three) of them for further scenario analysis in sub-model 2.

A functional specification of sub-model 1 is depicted in Figure 5-11 below.

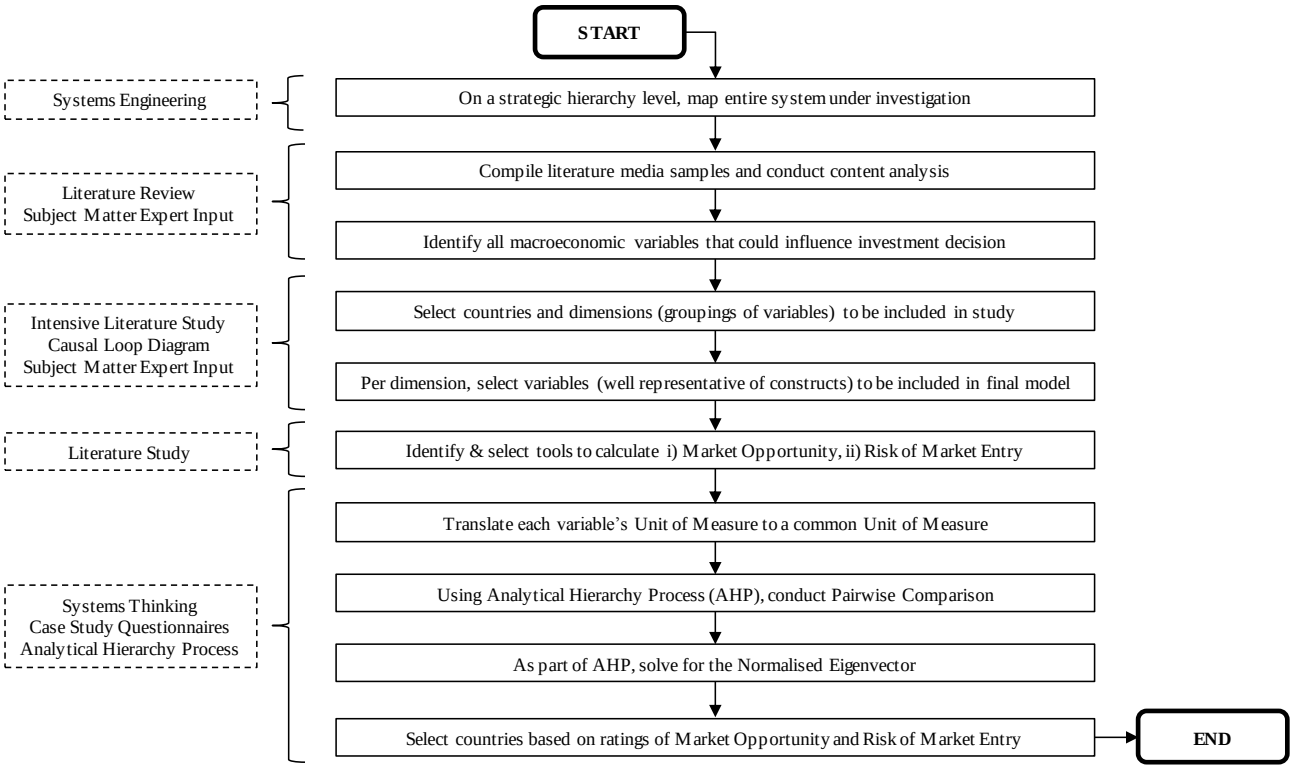

Figure 5-11: The proposed input-output model depicted as a process flow: Sub-model 1

A case study is conducted to validate sub-model 1, with an intentional sample of subject matter experts (SMEs) from the South African retail industry. From the results of the Analytical hierarchy process, it is concluded that the participants in the case study consider the variable of GDP growth as the most important 'opportunity' variable to take into consideration during foreign market expansion. GDP growth is thus assigned the greatest weight (of 24 per cent) for further calculation of the market attractiveness of the various Sub-Saharan African countries. The second-highest weight is assigned to the variable of GDP *per capita* at 22 per cent, then the variable for FDI inflow at 13 per cent. Furthermore, it is concluded that the participants consider the 'risk' variable representing the 'ease of doing business' as the most important (with a weight of 19.3 per cent). The second-highest weight is assigned to the 'risk' variable that indicate prevalence of corruption at 19.2 per cent, then the variable that measures the logistics performance (at 14 per cent).

The results from case study conducted to validate sub-model 1, estimated that the following Sub-Saharan African countries having the highest results for market attractiveness (based on data points collected in 2016 and 2017): Nigeria, Tanzania, Angola, Gabon, Ghana, and Ethiopia. These countries are identified as being favourable for market expansion.

5.3 SUB-MODEL 2: DISTRIBUTION NETWORK DESIGN AND THE STRATEGIC PROFIT MODEL

Chapter 5.3 presents the development of sub-model 2 through the application of a combination of the following tools and techniques identified in Chapter 2: distribution network design, Monte Carlo simulation, a strategic profit model, and benefit-cost analysis. The model will be validated by conducting a sensitivity analysis.

By combining these two tools in one sub-model, outputs are generated that provide stakeholders with the benefit and cost implications[7] that each strategic decision scenario under consideration would have for the supply chain. Even though a supply chain network simulation is a time-consuming and expensive exercise, it is essential that a business conduct this scenario analysis before making any major investment decisions.

The generated outputs from sub-model 1 provide us with the best selection of two or three Sub-Saharan African countries to consider for further scenario analysis per ranked country in the form of a DND. Each of the selected countries is now modelled as a scenario (in other words, scenario 1 is based on the first country selected for further investigation, scenario 2 is based on the second country, and so on). With focus on the distribution side of the supply chain, the investment decision will take into consideration the number of new stores opened (which is considered as the first indicator of the businesses' unit throughput and potential sales volumes), the various costs of importing goods into that market, storing inventory and processing units in an in-country warehouse, and the transportation cost of distributing products to stores. The supply chain network design generates the following outputs: a total estimation of sales; the cost of goods sold; inbound and outbound transport costs; and all other operational costs. By using these variables as inputs into a strategic profit model, important financial ratios can be calculated that give valuable insights into the potential benefits and costs of each scenario under consideration.

5.3.1 Distribution Network Design

From the literature review, it is clear that all the benefits and costs of a decision must be quantified to make a holistic and well-informed decision about foreign market expansion. Multiple supply chain variables have been identified as critical for inclusion as model inputs, including various costs (such as the cost of goods sold, transport, and other operational costs), the estimated unit demand (or 'sales'), and an estimate of the total assets. By using all these listed variables as input to the model, ratios can be calculated that are vital to investment decision-making, such as the gross margin, total operational cost, net income, net profit margin, asset turnover, and – most importantly – the return on assets or return on investment.

[7] 'Benefit' and 'cost' are the final two constructs on which this research has placed specific emphasis, and are complementary to the 'opportunity' and 'risk' constructs addressed in sub-model 1.

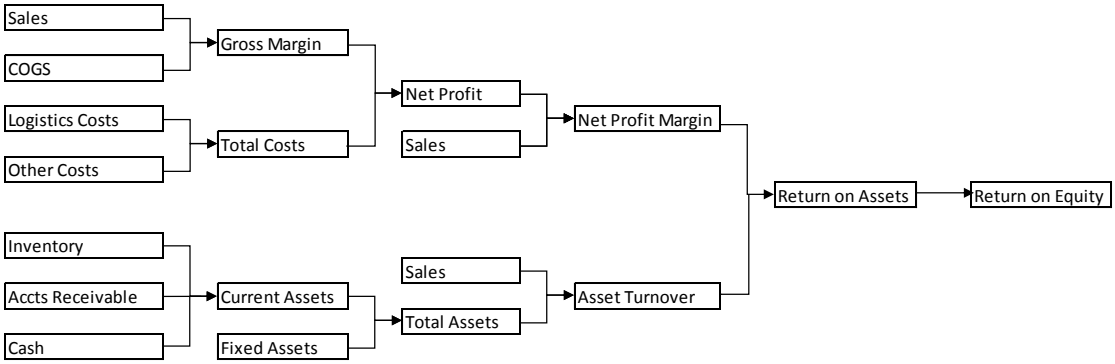

Figure 5-12: Strategic Profit Model (Coyle *et al.* 2013)

By considering the Strategic Profit Model in Figure 5-12, good measures for quantifying the benefit of the investment would be the ratio for net profit margin (NPM) and the return on assets (ROA). In order to calculate these ratios, the various cost and sales inputs must first be collected. These inputs can be derived through the completion of a distribution network design (as part of a typical supply chain strategy project). An intensive literature study of relevant journals and textbooks in the field of supply chain management is completed (Chapter 2: Literature review), from which all the inputs required to complete the distribution network design are identified. The inputs identified in Chapter 2.2.1 include: i) current and future vendors, and DC and store locations, ii) current annual throughput of units aggregated by product grouping, iii) projected store and unit growth for the design year[8], and iv) transport cost per unit or km. The outputs will give a view on any capital investment required, annual fixed operating costs, outbound variable costs, and total transport costs of the supply chain.

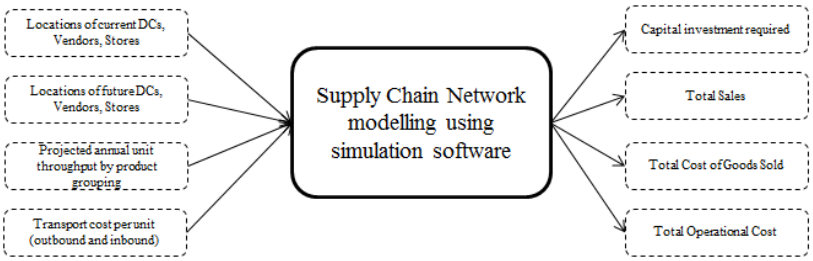

Figure 5-13: Simplified distribution network model

During distribution network design, various scenarios are constructed and simulated to compare various pre-defined scenarios with one another – in the case of this thesis, these scenarios reflect the costs and benefits of potentially entering each of a set of selected foreign markets. The output from sub-model 1 provides a list of countries that should be strongly considered for further market expansion. The output ranks Sub-Saharan countries against one another – one list indicating the perceived market opportunity, and the other list indicating the perceived risk of market entry for each country. Through critical evaluation of the two lists, a

[8] 'Design year' is the year in which the supply chain investment would take place.

handful of countries are selected for further supply chain network analysis. (The number of scenarios will depend on the time and resources available for simulation.)

After identifying the countries that are believed to have a high market potential, the distribution network design can be undertaken. Software such as LLamasoft LogicTools LogicNet Plus® XE (Llamasoft) is used to simulate multi-objective optimisation for various scenarios. It is critical to note (as highlighted in the research methodology) that the actual simulation process falls outside of the scope of this model design, and is thus outside the scope of this study. Network design will be addressed on a high level, but the actual simulation of the network design is not within the scope of this research.

5.3.2 Monte Carlo simulation

As there is significant uncertainty in estimating the required inputs, Monte Carlo simulation (and a typical triangular distribution) can be used to estimate profit, given uncertain demand and investment costs. Background to the Monte Carlo technique is discussed in Chapter 2.2.8 as part of the literature review.

Many software packages are available to conduct statistical simulation under uncertainty, as listed in Appendix F. For the scope and resources available for this study, a Microsoft Excel add-in called Risk Kit (Wehrspohn, 2017) is selected to run the Monte Carlo simulations and to compile a sensitivity analysis of the final outputs of sub-model 2.

To illustrate the workings of the proposed decision-support model, the variables that require simulation under uncertainty are:

- The total estimated sales, calculated by multiplying the estimated unit demand (which would vary for each scenario, depending on the country's potential market size) by the average sell price (which is assumed to remain unchanged across scenarios, but is a controllable variable that could be adjusted to manipulate the net profit margin)
- The cost of goods sold (the direct costs attributable to the production of the goods sold, which in the context of retail distribution would be the cost of supplying the goods from multiple vendors, and is assumed to remain unchanged across scenarios)
- Total inbound and outbound transport costs (both of these variables would vary from country to country, and thus vary across scenarios)
- Other operational costs (the value-add costs of the distribution operations of the supply chain)
- Estimated current assets (cash and other assets that are expected to be converted to cash within a year)
- The total fixed asset investment (the capital investment for opening a new distribution centre and opening about ten new stores as an initial attempt to market-entry)

Each of these variables contains a high amount of uncertainty, which makes Monte Carlo simulation the ideal tool for synthesising data points. When using a triangular distribution, three inputs are required for each variable: an optimistic, a most likely, and a pessimistic estimate.

By using the data collected as explained in 4.3.2, a hypothetical scenario is constructed to simulate a supply chain investment decision for foreign market expansion. Each of the inputs can be classified as being either controllable or uncontrollable: controllable variables are within the power of the stakeholder to adjust upward or downward to impact the profit margin positively; and uncontrollable variables are dependent on the selected country. For this scenario, it is assumed that stock is 'pushed'[9] to market. Based on experience of the retailer's successes in its host country, unit throughput can be estimated based on an average store size (measured in square meters). Focus is placed on the distribution side of getting stock to market, and the actual marketing attempts (the efforts to increase the sales) are excluded from the scope of this study.

Figure 5-14 and Figure 5-15 show the final hypothetical inputs used to illustrate and test the input-output model. Three variable inputs are used for each of the parameters (the parameters being the unit demand, sell price per unit, outbound and inbound transport cost, cost of goods sold, other operating costs, and current assets and capital investments for opening ten new stores and one in-country distribution centre).

Orange Cells: TRIANGULAR DISTRIBUTION

	UNIT DEMAND (market size):				
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	stdev:	529 150
				range:	1 000 000
Estimates:	3 000 000	2 200 000	2 000 000	CI at 90%:	502 511
X Stores:	10		2 426 495		

	SELL PRICE PER UNIT				
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	stdev:	20,82
				range:	40,00
Estimates:	R 120,00	R 90,00	R 80,00	CI at 90%:	19,77
			R 93,34		

	OUTBOUND TRANS UNIT COST				
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	stdev:	1,00
				range:	2,00
Estimates:	R 3,50	R 4,50	R 5,50	CI at 90%:	0,95
			R 3,87		

	INBOUND / IMPORT UNIT COST				
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	stdev:	2,00
				range:	4,00
Estimates:	R 3,00	R 5,00	R 7,00	CI at 90%:	1,90
			R 5,07		

Figure 5-14: Three inputs per variable for triangular distribution, and Monte Carlo outputs in orange cells

[9] 'Push' is a channel strategy in which a supply chain is designed to facilitate a 'push' of products to market, as opposed to a channel where distribution is 'pulled' by the level of market demand.

	ACTUAL UNIT COST					stdev:	12,58
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC	range:	25,00
Estimates:	R	55,00	R	65,00	R 80,00	CI at 90%:	11,95
					R 65,52		

	WHOUSING UNIT COST (OPEX)					stdev:	0,04
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC	range:	0,08
Estimates:	R	0,07	R	0,10	R 0,15	CI at 90%:	0,04
					R 0,12		

	CURRENT ASSETS					stdev:	3 307 189
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC	range:	6 250 000
Estimates:	R	500 000	R	5 500 000	R 6 750 000	CI at 90%:	3 140 694
					R 5 931 937		

	CAPEX FOR IN-COUNTRY DC					stdev:	6 557 439
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC	range:	13 000 000
Estimates:	R	75 000 000	R	80 000 000	R 88 000 000	CI at 90%:	6 227 315
					R 80 979 536		

	CAPEX FOR OPENING X STORES					stdev:	1 607 275
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC	range:	3 000 000
Estimates:	R	5 500 000	R	6 000 000	R 8 500 000	CI at 90%:	1 526 360
X Stores:	R	10			R 5 915 490		

Figure 5-15: Three inputs per variable for triangular distribution, and Monte Carlo outputs in orange cells

For the above example reflected in Figure 5-14 and Figure 5-15, Monte Carlo simulation is run for 1000 iterations. The orange output cells are the triangular variant from the Monte Carlo outputs. The detailed statistical outputs are depicted in Figure 5-16 below.

	Demand (units)	Sellprice / unit	COGS / unit	Outbound Transport Cost	Inbound Transport Cost	Other Opex	Current Assets	Capex to open one Distribution	Capex to open ten stores
Average	2 409 461	R 96,35	R 66,76	R 4,49	R 4,98	R 0,11	4 236 847	80 869 881	6 702 603
Standard Deviation	216 720	R 8,53	R 5,00	R 0,40	R 0,80	R 0,02	1 365 168	2 705 817	655 834
Skewness	162 759	R 6,32	R 2,81	R 0,15	R -	R 0,01	-	1 681 780	474 964
Kurtosis	266 439	R 10,52	R 6,23	R 0,50	R 0,99	R 0,02	1 701 098	3 390 410	806 428
Coefficient of Variation	0	R 0,09	R 0,07	R 0,09	R 0,16	R 0,15	0	0	0
Range	942 087	R 38,35	R 24,37	R 1,90	R 3,83	R 0,08	6 039 521	12 589 006	2 929 342
Range5_95	698 083	R 28,21	R 16,36	R 1,35	R 2,68	R 0,06	4 419 590	9 215 778	2 130 436
Minimum	2 021 273	R 80,34	R 55,47	R 3,55	R 3,14	R 0,07	625 386	75 136 686	5 514 987
Expected Tail <= 0,1%	2 024 102	R 80,61	R 55,59	R 3,56	R 3,17	R 0,07	662 795	75 178 961	5 536 317
0,01% - Quantile	2 021 273	R 80,34	R 55,47	R 3,55	R 3,14	R 0,07	625 386	75 136 686	5 514 987
0,1% - Quantile	2 026 930	R 80,88	R 55,70	R 3,58	R 3,20	R 0,07	700 205	75 221 236	5 557 648
1% - Quantile	2 043 139	R 81,54	R 56,72	R 3,63	R 3,29	R 0,08	999 042	75 667 019	5 604 015
2% - Quantile	2 063 619	R 82,64	R 57,50	R 3,70	R 3,41	R 0,08	1 219 819	75 937 176	5 650 771
3% - Quantile	2 079 526	R 83,41	R 58,02	R 3,77	R 3,48	R 0,08	1 423 529	76 179 938	5 693 351
4% - Quantile	2 093 539	R 83,68	R 58,54	R 3,78	R 3,53	R 0,08	1 566 034	76 348 339	5 726 320
5% - Quantile	2 106 463	R 83,88	R 58,90	R 3,81	R 3,61	R 0,08	1 668 916	76 516 675	5 752 775
10% - Quantile	2 149 724	R 85,90	R 60,14	R 3,97	R 3,89	R 0,09	2 151 374	77 432 777	5 895 095
80% - Quantile	2 612 839	R 104,70	R 71,13	R 4,85	R 5,72	R 0,12	5 472 142	83 171 255	7 327 965
90% - Quantile	2 730 316	R 108,77	R 73,71	R 5,04	R 6,05	R 0,13	5 806 356	84 758 145	7 644 482
95% - Quantile	2 804 546	R 112,10	R 75,25	R 5,16	R 6,29	R 0,14	6 088 506	85 732 452	7 883 211
99% - Quantile	2 894 507	R 115,47	R 77,83	R 5,34	R 6,63	R 0,14	6 486 855	86 747 883	8 180 546
99,9% - Quantile	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329
99,99% - Quantile	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329
Expected Tail >= 99,9%	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329
Maximum	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329

Figure 5-16: Monte Carlo outputs from hypothetical scenario to test model

The outputs generated by the Monte Carlo calculations will now serve as the input to the strategic profit model, which is discussed next.

5.3.3 Strategic profit model for financial ratios

By using the outputs from the Monte Carlo simulation exercise, the strategic profit model is populated to calculate the final benefits and costs for each scenario under investigation, based on the ratios in Figure 5-17.

VARIABLE	SYMBOL
Sales	S
Cost of Goods Sold	CGS
Gross Margin	GM = S - CGS
Transportation	TC
Warehousing	WC
Inventory carrying	IC = IN X W
Other operating cost	OOC
Total operating cost	TOC
Earnings before interest & tax	EBIT
Interest	INT
Taxes	TX
Net income	NI
ASSET DEPLOYMENT	
Inventory	IN
Accounts receivable	AR
Cash	CA
Fixed assets	FA
Total assets	TA
RATIO ANALYSIS	
Profit margin	NI / S
Return on assets	NI / TA
Inventory turns/year	CGS / IN
Transportation as % sales	TC / S
Warehousing as % sales	WC / S
Inventory carrying as % sales	IC / S

Figure 5-17: Financial ratios to use for holistic decision-making (Coyle *et al.* 2013)

The ratios of net profit margin and return on assets are good measures of the benefits of the investment decision, with the total operating cost and total assets being a fitting reflection of the cost of the investment decision. For the hypothetical inputs used to test this model, the various ratios are calculated by using the format of a strategic profit model. An example of the outputs is displayed in Table 5-25.

Table 5-25: Financial ratios calculated for hypothetical scenario of foreign market expansion

	SAMPLE
*Total unit demand	2 421 660
*Sell price per unit	R 85,57
= sales	R 207 219 945
*cost of goods sold	R 158 668 878
GROSS MARGIN	R 48 551 066
*outbound transport cost	R 10 981 525
*inbound transport cost	R 13 840 563
*other operating costs	R 245 830
TOTAL OPERATING COST	R 25 067 918
NET INCOME	R 23 483 148
NET PROFIT MARGIN	11%
*dc capex	R 87 043 228
*opening stores capex	R 7 034 133
fixed assets	R 94 077 361
*current assets	R 4 465 439
TOTAL ASSETS	R 98 542 800
ASSET TURNOVER	210%
RETURN ON ASSETS	24%

The ratios displayed in Table 5-25 can be calculated for each scenario simulated during the DND. The cost and benefit outputs can now be scrutinised and compared with one another to make an informed investment decision. These financial ratios are typically used during engineering economics to construct business cases for investment decisions.

In reality, the total estimated unit demand of a foreign market could be calculated for each country by means of third-party marketing research. (This is not covered in the scope of this study, but is still strongly recommended for a holistic decision-making approach.) For the purpose of illustration, an estimate calculation is done by assuming that the retailer would open ten average-sized new retail stores in an urban market environment. The total unit demand is multiplied by the average estimated ‘sell price per unit’ to give an approximation of the total potential sales across each of the selected markets. An estimate for ‘sell price’ can be deduced by calculating the current average sell price of similar retail commodities in the South African market. A full-scale supply chain strategy project would go into a deeper level of detailed calculations by conducting product aggregation, and by estimating the total ‘sales per product type’. However, for the purpose of this thesis, and without going into the inner workings of the strategic model, a single estimate is used during model validation (as explained in the example). Furthermore, the cost of goods sold is deducted from the total sales to calculate the gross margin, which is a valuable indicator of the financial benefit (conveyed on a ‘per unit’ level) that a retailer could realise when entering a market.

Two variables that are expected to vary greatly between various countries are the inbound and outbound transportation costs. Developing African countries have varying levels of infrastructure development, which is directly correlated with the cost of distribution. Transportation costs and other operating costs are added together to calculate the total operating cost. Hereafter, the net income can be calculated by subtracting the total operating cost from the gross margin. Net profit margin is now calculated as a percentage value, by dividing the net income by the total sales.

The total value of fixed assets (consisting of the capital investment required to open a new distribution centre and ten new average-sized retail stores) is added to the estimated current assets, to calculate the value of the total assets of the business. By dividing the estimated total assets figure by the total sales, a ratio is calculated that reflects the asset turnover. (This ratio can often be used as an indicator of the efficiency with which a company is deploying its assets in generating revenue.)

Finally, the return on assets is calculated as the final indicator of investment benefit. This is calculated by dividing the net income by the total assets.

5.3.4 Benefit-cost analysis

A simple benefit-cost analysis can be conducted by combining what-if analysis with the strategic profit model outputs. Newnan *et al*. (2004) explain that the benefit-cost analysis is based on the concept of total benefits (B) minus total cost (C) being greater than or equal to zero (Equation 1), otherwise stated as the benefits divided by the cost being greater or equal to one (Equation 2).

Equation 1 $\boldsymbol{B - C \geq 0}$

Equation 2 $\boldsymbol{\frac{B}{C} \geq 1}$

In a scenario where both benefits and costs are variable inputs, an incremental benefit-cost ratio analysis can be conducted; the alternative with the highest ratio will then be considered to be the most attractive option.

In the hypothetical example in Figure 5-18 below, for each increment of investment where Equation 2 holds as being true, the investment is considered to be an attractive alternative to consider for further investigation.

BENEFIT-COST RATIO ANALYSIS

	A	B	C	D	E
GROSS MARGIN	R 44 000 000	R 46 000 000	R 48 000 000	R 50 000 000	R 52 000 000
TOTAL OPS COST	R 18 000 000	R 22 000 000	R 25 000 000	R 26 000 000	R 26 500 000
B/C	*2,44*	*2,09*	*1,92*	*1,92*	*1,96*

	B-A	C-B	D-C	E-D
DELTA B/C	0,50	0,67	2,00	4,00

Figure 5-18: Example of a typical benefit-cost ratio analysis

In the example, increment D-C is attractive (with C being most desirable) and E-D is also considered attractive (with D being desirable). B-A and C-B are not attractive options, as the benefit-cost ratio is less than 1. From these options, alternative C would thus be the most desirable for investment. (Note that, with this approach, the most desirable scenario is not necessarily the one with the highest benefit-cost ratio.)

5.3.5 Validation of sub-model 2: a sensitivity analysis

A sensitivity analysis is conducted to confirm the logic of the strategic profit model, based on the Monte Carlo simulated data points. Sensitivity analysis is a statistical technique used to measure the impact of

different input variables on the final output of the model. This is done by incrementally changing selected input variables while keeping all other variables fixed, and tracking the intensity of the changes across the final output graphs. Sensitivity analysis is conducted to confirm the model construct, using a typical what-if analysis approach that allows multiple input variables to be changed at the same time.

The simulation detail and inner workings of sub-model 2 will receive less focus in this thesis than does sub-model 1, as the scope would creep drastically into a much larger study than indicated in the research proposal. It is vital, however, to include some form of review and discussion, as the aim of this research is to take a holistic approach to complex decision modelling. The mathematics of the supply chain network simulation falls outside the scope of the strategic input-output model. Real data inputs for such a model are considered to be highly sensitive information that is not to be made publicly available by retailers. A 'best guess' is used with the assistance of Monte Carlo simulation (a powerful tool for synthesising data points under uncertainty).

It is critical for stakeholders to understand the benefit and cost impact of a decision; but investment decisions contain many uncertain variables. The first step in addressing each variable and its impact on the profit model is to identify which model inputs are controllable and which are uncontrollable. In the case of this research study, the unit throughput and sell price are considered to be 'controllable'. Even though sales are largely considered to be an uncontrollable variable, a retailer can take a stock distribution 'push' approach by initially distributing a planned number of units to a store. By keeping the figures for estimated sales and COGS static across each of the different scenarios, these two variables would be regarded as known and controllable variables, whereas the variables for costs (inbound and outbound transportation, other operation costs, fixed and current assets) are the uncontrollable variables in the model.

Sensitivity analysis is conducted by using the Risk Kit Microsoft Excel Add-in, and the findings are discussed below.

Orange Cells: TRIANGULAR DISTRIBUTION

	UNIT DEMAND (market size):			stdev:	529 150
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	1 000 000
Estimates:	3 000 000	2 200 000	2 000 000	CI at 90%:	502 511
X Stores:	10		2 426 495		

	SELL PRICE PER UNIT			stdev:	20,82
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	40,00
Estimates:	R 120,00	R 90,00	R 80,00	CI at 90%:	19,77
			R 93,34		

	OUTBOUND TRANS UNIT COST			stdev:	1,00
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	2,00
Estimates:	R 3,50	R 4,50	R 5,50	CI at 90%:	0,95
			R 3,87		

	INBOUND / IMPORT UNIT COST			stdev:	2,00
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	4,00
Estimates:	R 3,00	R 5,00	R 7,00	CI at 90%:	1,90
			R 5,07		

	ACTUAL UNIT COST							stdev:	12,58
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC			range:	25,00
Estimates:	R	55,00	R	65,00	R	80,00		CI at 90%:	11,95
							R 65,52		

	WHOUSING UNIT COST (OPEX)							stdev:	0,04
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC			range:	0,08
Estimates:	R	0,07	R	0,10	R	0,15		CI at 90%:	0,04
							R 0,12		

	CURRENT ASSETS							stdev:	3 307 189
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC			range:	6 250 000
Estimates:	R	500 000	R	5 500 000	R	6 750 000		CI at 90%:	3 140 694
							R 5 931 937		

	CAPEX FOR IN-COUNTRY DC							stdev:	6 557 439
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC			range:	13 000 000
Estimates:	R	75 000 000	R	80 000 000	R	88 000 000		CI at 90%:	6 227 315
							R 80 979 536		

	CAPEX FOR OPENING X STORES							stdev:	1 607 275
Range:	OPTIMISTIC		MOST LIKELY		PESSISMISTIC			range:	3 000 000
Estimates:	R	5 500 000	R	6 000 000	R	8 500 000		CI at 90%:	1 526 360
X Stores:	R	10					R 5 915 490		

Figure 5-19: Three inputs selected for each variable and the outputs of Monte Carlo simulation in orange

Chapter 5.3.2 explains the process of applying Monte Carlo simulation using triangular distribution and Figure 5-19 above is a depiction of the results used during model validation.

The application of the strategic profit model is explained in Chapter 5.3.3 . The example in Figure 5-20 will be used to test outputs with a linear sensitivity analysis and with a what-if analysis.

	SAMPLE
*Total unit demand	2 421 660
*Sell price per unit	R 85,57
=	
sales	R 207 219 945
*cost of goods sold	R 158 668 878
GROSS MARGIN	R 48 551 066
*outbound transport cost	R 10 981 525
*inbound transport cost	R 13 840 563
*other operating costs	R 245 830
TOTAL OPERATING COST	R 25 067 918
NET INCOME	R 23 483 148
NET PROFIT MARGIN	11%
*dc capex	R 87 043 228
*opening stores capex	R 7 034 133
fixed assets	R 94 077 361
*current assets	R 4 465 439
TOTAL ASSETS	R 98 542 800
ASSET TURNOVER	210%
RETURN ON ASSETS	24%

Figure 5-20: Output results to test the strategic profit model by using Monte Carlo simulation

5.3.5.1 Impact of variables on the gross margin

The first iteration of the sensitivity analysis is conducted on the impact that three variables – unit demand, sell price, and cost of goods sold – have on the gross margin.

Table 5-26: What-if analysis on sales: Total unit demand vs sell price

WHAT-IF ON SALES: unit demand vs sell price

		unit demand				
		2 000 000	2 100 000	2 200 000	2 600 000	3 000 000
sell price	R 80,00	R 160 000 000	R 168 000 000	R 176 000 000	R 208 000 000	R 240 000 000
	R 85,00	R 170 000 000	R 178 500 000	R 187 000 000	R 221 000 000	R 255 000 000
	R 90,00	R 180 000 000	R 189 000 000	R 198 000 000	R 234 000 000	R 270 000 000
	R 105,00	R 210 000 000	R 220 500 000	R 231 000 000	R 273 000 000	R 315 000 000
	R 120,00	R 240 000 000	R 252 000 000	R 264 000 000	R 312 000 000	R 360 000 000

The above table depicts a what-if analysis based on the ranges of two million to three million units, and an average unit sell price of R80 to R120. This results in total sales values of between R160 million and R360 million. A stakeholder of a retail company can now make an informed comparison between these results and the current total sales made in the retailer's host country.

Table 5-27: What-if analysis on cost of goods sold: Cost per unit vs total unit demand

WHAT-IF ON COGS: cogs per units vs unit demand

		cogs/unit				
		R 55	R 60	R 65	R 73	R 80
unit demand	2 000 000	110 000 000	120 000 000	130 000 000	145 000 000	160 000 000
	2 100 000	115 500 000	126 000 000	136 500 000	152 250 000	168 000 000
	2 200 000	121 000 000	132 000 000	143 000 000	159 500 000	176 000 000
	2 600 000	143 000 000	156 000 000	169 000 000	188 500 000	208 000 000
	3 000 000	165 000 000	180 000 000	195 000 000	217 500 000	240 000 000

The above table depicts a what-if analysis based on the ranges of two million to three million units, and an average unit COGS of R55 to R80. This results in total COGS values of between R110 million and R240 million.

Table 5-28: What-if analysis on gross margin: total sales vs cost of goods sold

WHAT-IF ON GROSS MARGIN: sales vs cogs

		sales				
		R 160 000 000	R 210 000 000	R 260 000 000	R 310 000 000	R 360 000 000
cogs	R 110 000 000	50 000 000	100 000 000	150 000 000	200 000 000	250 000 000
	R 142 500 000	17 500 000	67 500 000	117 500 000	167 500 000	217 500 000
	R 175 000 000	- 15 000 000	35 000 000	85 000 000	135 000 000	185 000 000
	R 207 500 000	- 47 500 000	2 500 000	52 500 000	102 500 000	152 500 000
	R 240 000 000	- 80 000 000	- 30 000 000	20 000 000	70 000 000	120 000 000

Combining Table 5-26 and Table 5-27, a what-if analysis is now based on the ranges of sales being R160 million to R360 million, at an average total COGS of R110 million to R240 million. This results in a gross margin value that ranges from a potential loss of R80 million to a potential profit of R250 million. From

these results, stakeholders now have a view on the break-even point between the total sales and cost of goods sold.

Furthermore, a sensitivity analysis is conducted on the Monte Carlo variables produced for the inputs of the strategic profit model. The results from the sensitivity analysis are summarised in Figure 5-21 below, and separate graphs for each variable are included in Appendix H.

From the what-if analysis and linear sensitivity analyses, it is clear that sell price has the greatest impact on the gross margin. In the Monte Carlo simulation, the input values have a large range with a standard deviation of R25 over an average value of R93. The outcome of the sell price being the most sensitive variable to impact the gross margin, is a positive outcome in context of the hypothetical scenario, as the sell price is a controllable variable that can be adjusted by stakeholders in an attempt to drive up sales, to positively impact the unit demand.

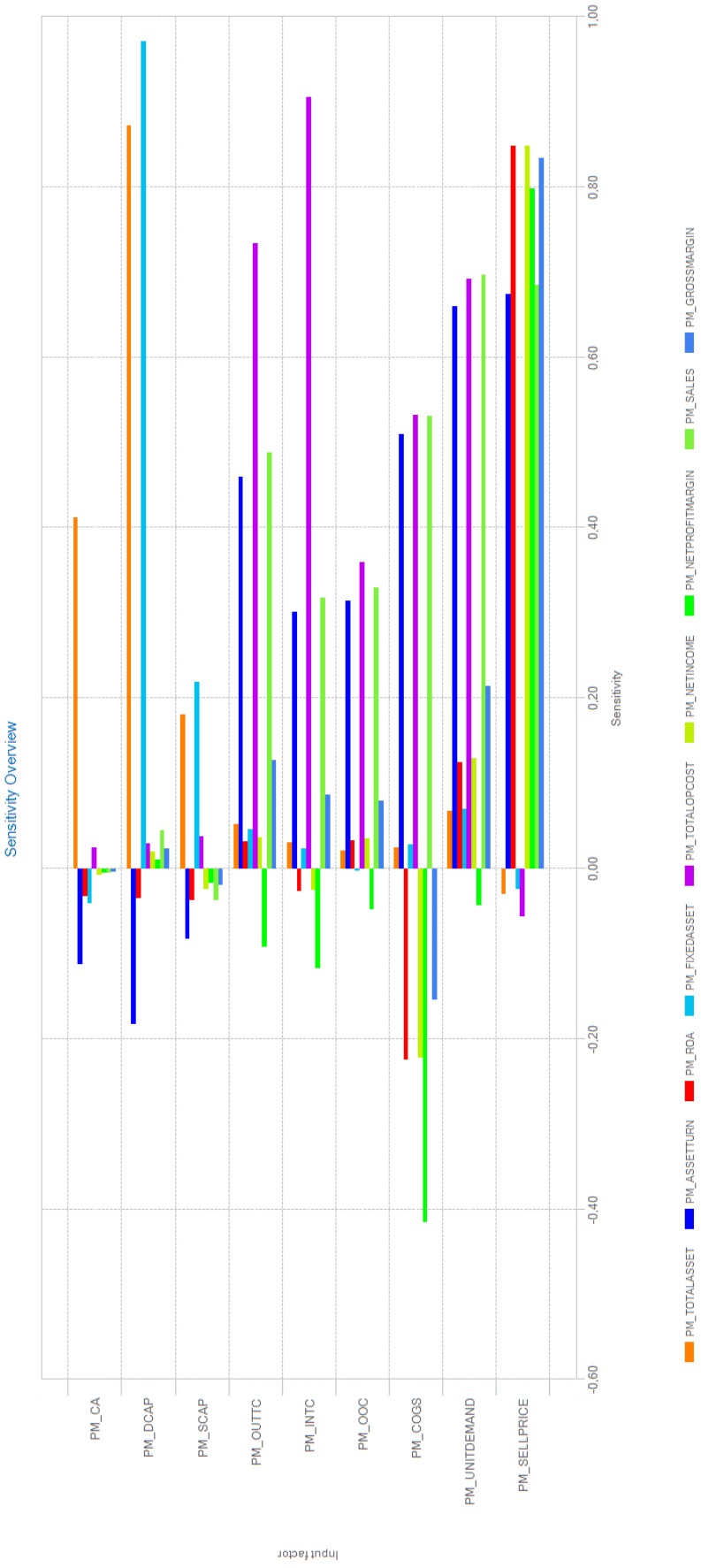

Figure 5-21: Final summary of the linear sensitivity analysis

5.3.5.2 Impact of variables on the net income and profit margin

Table 5-29: What-if analysis on total operating cost: transport costs vs unit demand

WHAT-IF ON TOTAL OPERATING COST: inbound & outbound transport costs vs unit demand

		inbound & outbound transport cost per unit				
		R 6,50	R 8,00	R 9,50	R 11,00	R 12,50
unit demand	2 000 000	R 13 245 830	R 16 245 830	R 19 245 830	R 22 245 830	R 25 245 830
	2 100 000	R 13 895 830	R 17 045 830	R 20 195 830	R 23 345 830	R 26 495 830
	2 200 000	R 14 545 830	R 17 845 830	R 21 145 830	R 24 445 830	R 27 745 830
	2 600 000	R 17 145 830	R 21 045 830	R 24 945 830	R 28 845 830	R 32 745 830
	3 000 000	R 19 745 830	R 24 245 830	R 28 745 830	R 33 245 830	R 37 745 830

The above table depicts a what-if analysis based on the ranges of R6.50 to R12.50 for the transport cost per unit, and a total unit demand of two million to three million units. This results in total operating cost values of between R13 million and R37 million. A stakeholder of a retail company can now make an informed comparison between these results and the actual supply chain operating cost per unit in the retailer's current business.

Table 5-30: What-if analysis on net income: gross margin vs total operating cost

WHAT-IF ON NET INCOME: gross margin vs total operating cost

		gross margin				
		2 500 000	26 875 000	51 250 000	75 625 000	100 000 000
total op cost	13 000 000	R -10 500 000	R 13 875 000	R 38 250 000	R 62 625 000	R 87 000 000
	19 250 000	R -16 750 000	R 7 625 000	R 32 000 000	R 56 375 000	R 80 750 000
	25 500 000	R -23 000 000	R 1 375 000	R 25 750 000	R 50 125 000	R 74 500 000
	31 750 000	R -29 250 000	R -4 875 000	R 19 500 000	R 43 875 000	R 68 250 000
	38 000 000	R -35 500 000	R -11 125 000	R 13 250 000	R 37 625 000	R 62 000 000

The above table depicts a what-if analysis based on the ranges of R2.5 million to R100 million gross margin, and a total operating cost of R13 million to R38 million. This results in total net income values ranging from a potential loss of R10 million to a potential net income of R62 million.

Table 5-31: What-if analysis on net profit margin: sales vs net income

WHAT-IF ON NET PROFIT MARGIN: sales vs net income

		sales				
		R 160 000 000	R 210 000 000	R 260 000 000	R 310 000 000	R 360 000 000
net income	R 1 000 000	1%	0%	0%	0%	0%
	R 22 500 000	14%	11%	9%	7%	6%
	R 44 000 000	28%	21%	17%	14%	12%
	R 65 500 000	41%	31%	25%	21%	18%
	R 87 000 000	54%	41%	33%	28%	24%

The above table depicts a what-if analysis based on the ranges of R160 million to R360 million in total sales, and a net income of R1 million to R87 million. This results in total profit margin values ranging between 1% and 24%.

For the purposes of this investigation, gross margin is regarded as the benefit of the market expansion decision, with total operational cost regarded as the final cost parameter.

5.3.5.3 Impact of variables on return on assets

Table 5-32: What-if analysis on return on assets: total assets vs net income

WHAT-IF ON RETURN ON ASSETS: total assests vs net income

		total assets				
		R 60 000 000	R 80 000 000	R 100 000 000	R 120 000 000	R 140 000 000
net income	R 1 000 000	2%	1%	1%	1%	1%
	R 22 500 000	38%	28%	23%	19%	16%
	R 44 000 000	73%	55%	44%	37%	31%
	R 65 500 000	109%	82%	66%	55%	47%
	R 87 000 000	145%	109%	87%	73%	62%

The above table depicts a what-if analysis based on the ranges of R60 million to R140 million in total sales, and a net income of R1 million to R87 million. This results in a return on assets ratio ranging between 2% and 62%.

5.3.6 Conclusion to sub-model 2

Chapter 5.3 presents a systematic approach to the development of sub-model 2, by combining the following tools and techniques: distribution network design, Monte Carlo simulation, a strategic profit model, and a benefit-cost analysis. By combining these two tools in one sub-model, outputs are generated that provide stakeholders with the benefit and cost implications[10] that each strategic decision scenario under consideration would have for the supply chain. Hypothetical values are used for testing and validating the model construct.

A functional specification to sub-model 1 is depicted in Figure 5-22 below.

[10] 'Benefit' and 'cost' are the final two constructs on which this research has placed specific emphasis, and are complementary to the 'opportunity' and 'risk' constructs addressed in sub-model 1.

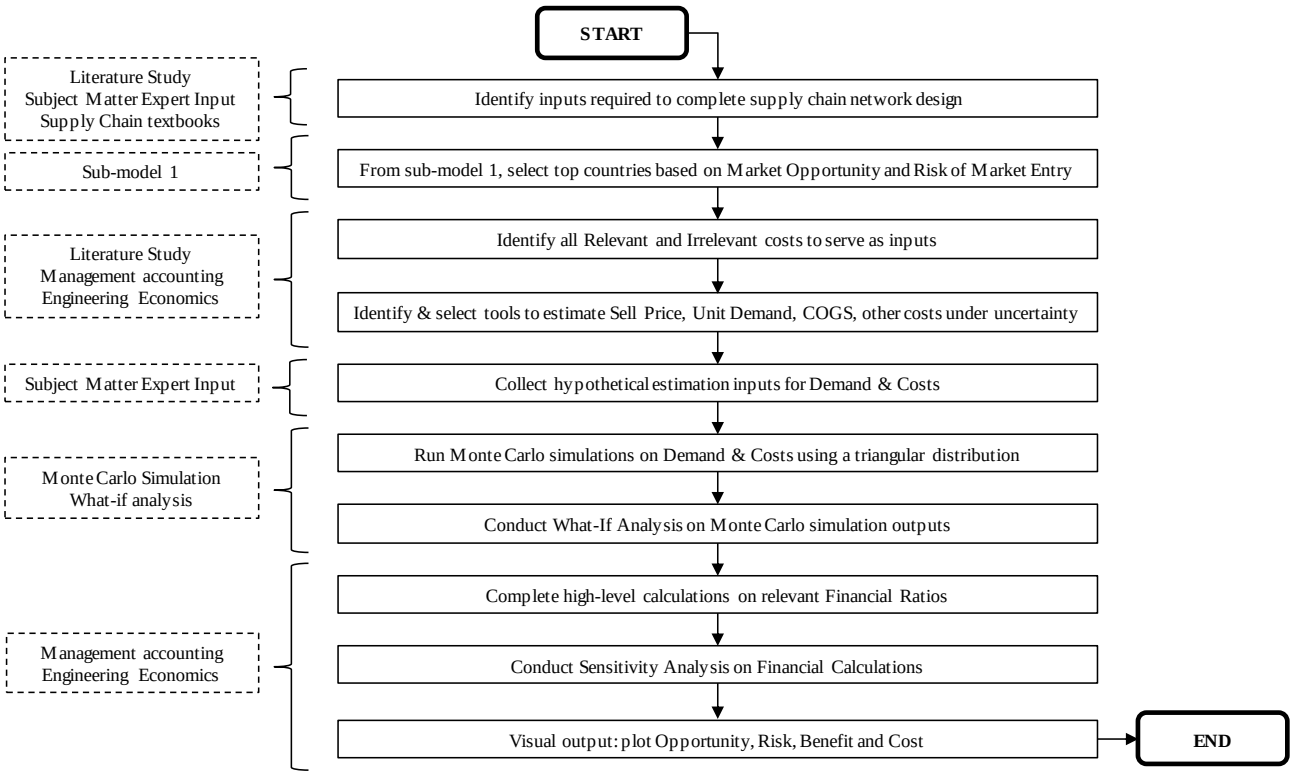

Figure 5-22: The proposed input-output model depicted as a process flow: Sub-model 2

All variable inputs required for the completion of a distribution design network is identified in Chapter 2.2. These quantitative inputs include: the total unit demand and sell price per unit (which equates to total sales); the cost of goods sold; total operating cost (including inbound and outbound transportation costs, and other operating costs); final gross margin as an indicator of profitability; and lastly, the return on assets or return on investment to quantify the final impact of the investment decision.

The supply chain network design generates the following outputs: a total estimation of sales; the cost of goods sold; inbound and outbound transport costs; and all other operational costs. By using these variables as inputs into a strategic profit model, important financial ratios can be calculated that give valuable insights into the potential benefits and costs of each scenario under consideration. The outputs from the network design are then used as inputs to the strategic profit model, to calculate basic financial ratios. The profit margin and return on assets are calculated with a strategic profit model, and these are considered to represent well the benefits and costs of each investment scenario under consideration.

5.4 CONCLUSION: PROPOSED INPUT-OUTPUT MODEL

Chapter 5 discussed the development of the decision-support model, based on the scientific method and systems thinking approach. The tools and techniques identified in Chapter 2 are now combined to include all the qualitative and quantitative variables identified throughout the research process. The model development is completed in two development sprints: ‘sub-model 1’ and ‘sub-model 2’.

Development of sub-model 1 is discussed in Chapter 5.2, through application of the following tools or techniques: a literature content analysis; secondary data analysis; and the Analytical hierarchy process. Similarly, the development of sub-model 2 is discussed in Chapter 5.3, through application of the following tools or techniques: distribution network design, Monte Carlo simulation, a strategic profit model and benefit-cost analysis.

By completing a rigorous literature review and literature content analysis, using experiential knowledge, and conducting interviews with industry experts across three fields of study (macro-economics, supply chain network design, and management accounting), a decision-support model for addressing the investment decision is constructed. The decision-support model in this research is scoped to focus on the strategic level only, with the tactical and operational variables falling outside of its scope.

In order to determine which variables are required as inputs to the model, it is necessary first to clarify what the expected output deliverables of the model are. From the preliminary reading, four constructs have been identified that a stakeholder should consider during investment decision-making on a strategic level: the opportunity, risk, benefit, and cost of the investment. If a model could be synthesised to deliver a quantitative output for each of these, the constructs could be presented simultaneously, allowing stakeholders to consider various investment scenarios carefully before making a final decision on the expansion into a foreign market. The various scenarios under scrutiny in this study consist of each of the foreign countries that a retailer has the realistic possibility of entering in the near future. The variables that are identified as being critical for consideration during the investment decision will serve as inputs to the model, and would be considered for each of these country scenarios.

For the first two model outputs mentioned above, ‘opportunity’ and ‘risk’, is determined by investigating the macro-economic variables of each of the countries that are considered for foreign market expansion. From the conclusion of Chapter 2.3 (Literature section 2: Empirical data collection), an exhaustive list is compiled of variables that could be well representative of the market opportunity of an investment decision, as well as the potential risk of foreign market entry. This list of ‘opportunity’ and ‘risk’ variables is refined to a smaller selection, by using appropriate analytical tools and techniques during model development. The next two required model outputs of ‘cost’ and ‘benefit’, on the other hand, is calculated by applying tools and techniques from the discipline of financial management, which considers the impact of input variables on a strategic profit model.

As explained in Chapter 1.3.2, the engineering approach is taken throughout the thesis. The second and third steps in this approach are “identify important factors” and “propose a model”. In order to complete these steps and present the four main constructs of the study, the tools and techniques that would be most suitable for addressing the research problem in its specific context need to be identified first. A literature review is completed in Chapter 2, and from the conclusion of Chapter 2.2 (Literature section 1: Key constructs and research context), the third research question of this study is effectively answered: ‘What tools and

techniques can be applied to include all the identified qualitative and quantitative variables in a single decision-support model?' The tools and techniques (listed in the order in which they would be used during model synthesis) include: a systems thinking approach and strategic input-output model design; a focus on distribution network design (DND) as derived from the supply chain management discipline; other tools identified for quantifying the qualitative input variables, such as the analytical hierarchy process (AHP) and general statistical analysis; application of a strategic profit model (SPM) as derived from the fields of engineering economics and financial management; other tools for conducting statistical analysis to test the final proposed model, including a correlation analysis across qualitative macro-economic input variables, Monte Carlo simulation with a triangular distribution for creating data points under uncertainty; sensitivity and what-if analysis to test the impact of input variables on the final presented outputs; and the use of a case study to test the AHP approach.

With a strong focus on the supply chain of a retailer, these tools and techniques are now combined and tested to present a holistic model that is simple enough for stakeholders to use in making decisions during expansion efforts. In order to simulate the complex real-world phenomena within the given time, scope and expertise, a design approach is taken that proposes the simple strategic input-output model depicted in Figure 5-23.

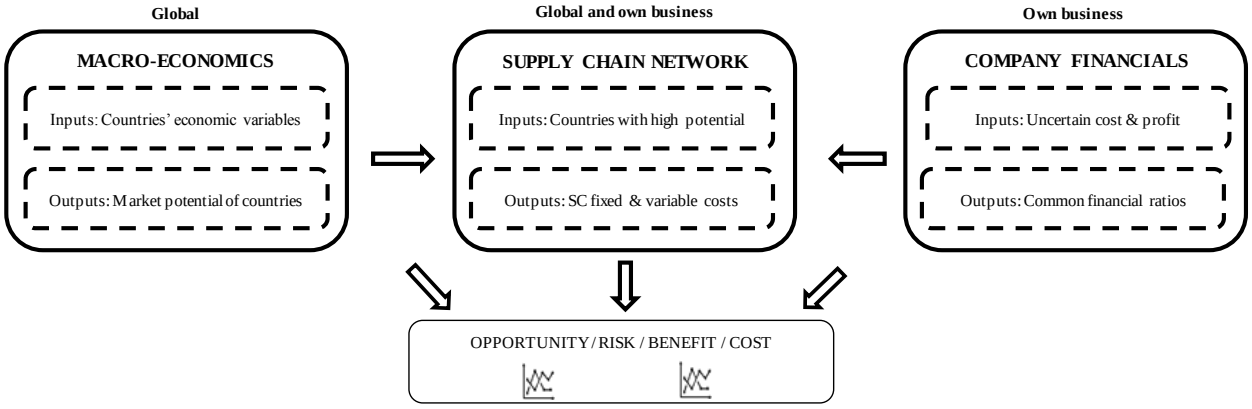

Figure 5-23: A depiction of the final proposed decision-support model with its inputs and outputs

Figure 5-23 above is a high-level visual depiction of the system under investigation, and each of the disciplines included in the study (macro-economics, supply chain management, and financial management) is represented by a box with an indicator of whether the data for its input variables is collected from global sources or within the business itself. The outputs of each box serve as input to another box, with a more detailed depiction shown in Figure 5-26: The final proposed decision-support model.

The proposed model consists of two sub-models whose output should be viewed in parallel to make the most well-informed decision possible. The first sub-model is of a more qualitative nature, as it considers macro-economic variables and indices, while the second sub-model is considered to be a quantitative business case (considering the fields of supply chain network and company financials in combination) for determining whether foreign market expansion would be financially feasible or not. Keep in mind that the investment

decision can be made across three different levels: strategic, tactical, and operational; but this study will focus on the strategic level only, with the tactical and operational variables falling outside of its scope.

Sub-model 1 is depicted as a process flow in Figure 5-24.

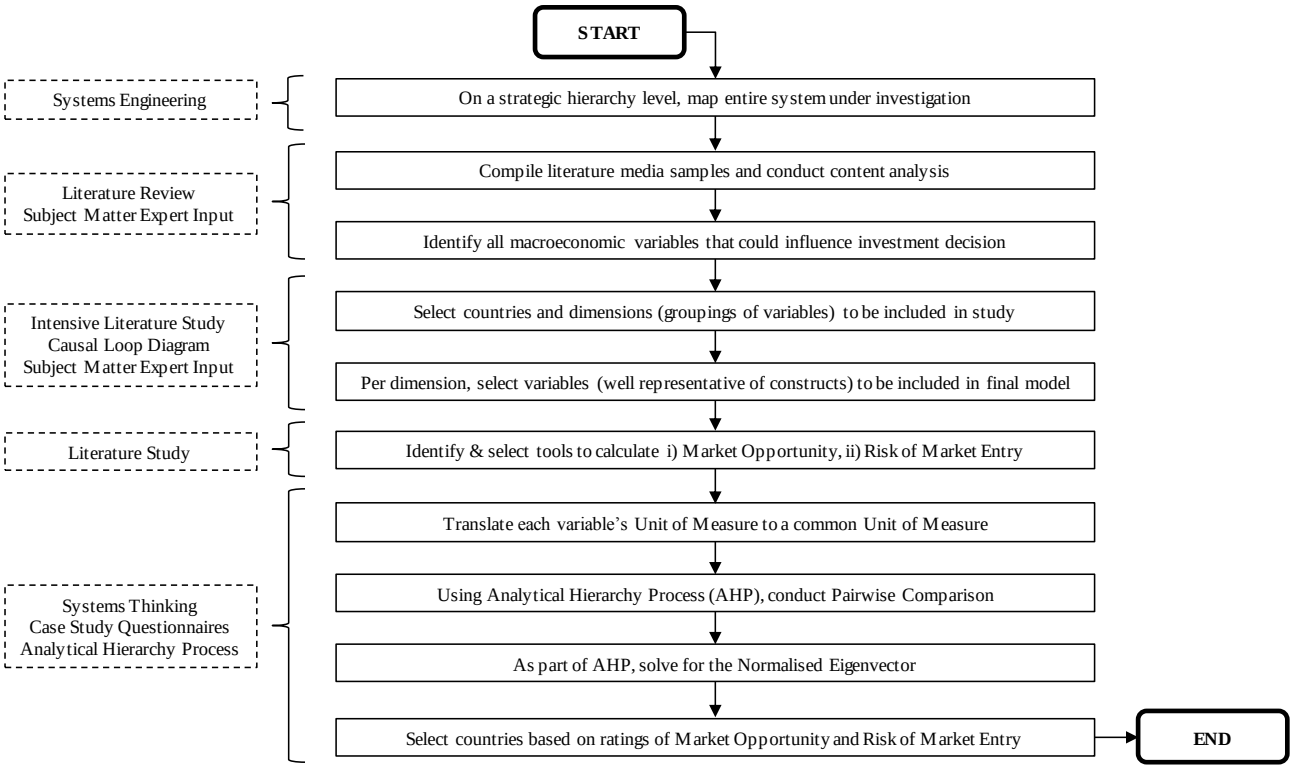

Figure 5-24: The proposed input-output model depicted as a process flow: Sub-model 1

By consistently taking a systems thinking approach, the first step of the synthesis of sub-model 1 is to map the entire system on a strategic level. Thereafter, an exhaustive list is compiled of all macro-economic input variables that could possibly have an impact on the market opportunity or risk of foreign market entry. Before the collection of secondary data points begins, countries are selected to be included as part of the specific scope of investigation, as well as dimensions into which one can group the input variables. By using the identified tools and techniques, the final selection of macro-economic input variables is now converted into two final outputs: the market opportunity and the risk of investing in the market. This is done by initiating an iterative process of reducing the input variable selection through literature content analysis. Secondary data points are then collected for each input variable in the final list, and each unit of measure is converted into a common unit of measure that would enable the variables to be compared against one another. Through correlation analysis and analytical hierarchy process (AHP), a rating can now be assigned for the opportunity and risk of each country within scope.

By assigning an 'opportunity' and 'risk' rating to each country, an informed decision can be made about which countries should be further investigated, based on having a combination of the highest market attractiveness and lowest perceived risk of investment. From these findings, the sample size of countries

under consideration is reduced drastically, with the aim of selecting only a handful of countries for further scenario analysis in sub-model 2.

Sub-model 2 is depicted as a process flow in Figure 5-25.

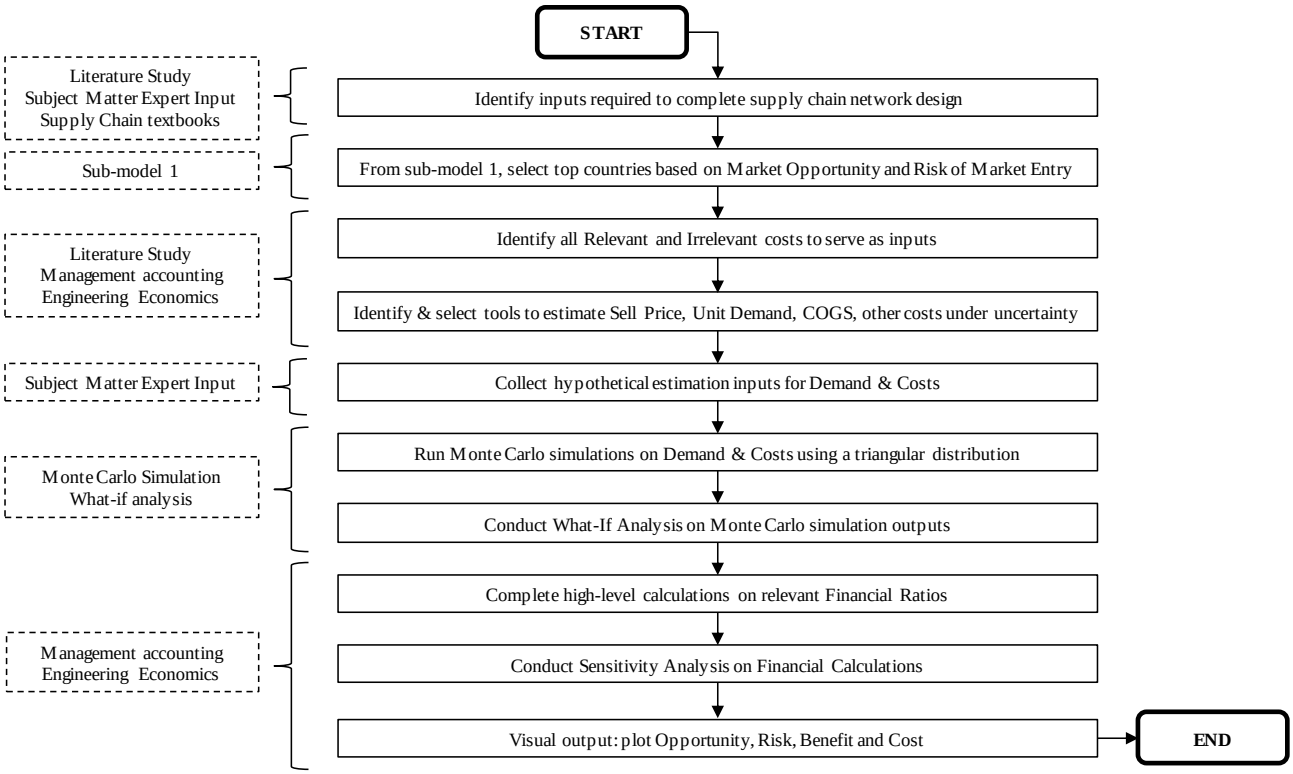

Figure 5-25: The proposed input-output model depicted as a process flow: Sub-model 2

Countries selected as outputs from sub-model 1 are now considered as investment scenarios to be analysed in sub-model 2 by conducting a distribution network design of the retailer's supply chain. In order to assess and compare the scenarios against one another, more inputs are required to get useful outputs from sub-model 2. For each scenario to be analysed, a set of variable and fixed costs are required as input to the model. These inputs contain a high level of uncertainty, and it should be noted that outputs from sub-model 2 will only be as accurate as the inputs that were provided. In fact, one should remember that "all models are wrong" as the statistician, George Box, is commonly quoted to have said (Box, 1976) – some models are just more accurate than others. The outputs from the network design are then used as inputs to the strategic profit model, to calculate basic financial ratios. Final outputs from sub-model two would be ratios that represent well the benefits and costs of each investment scenario.

The final proposed decision-support model is depicted in Figure 5-26 below.

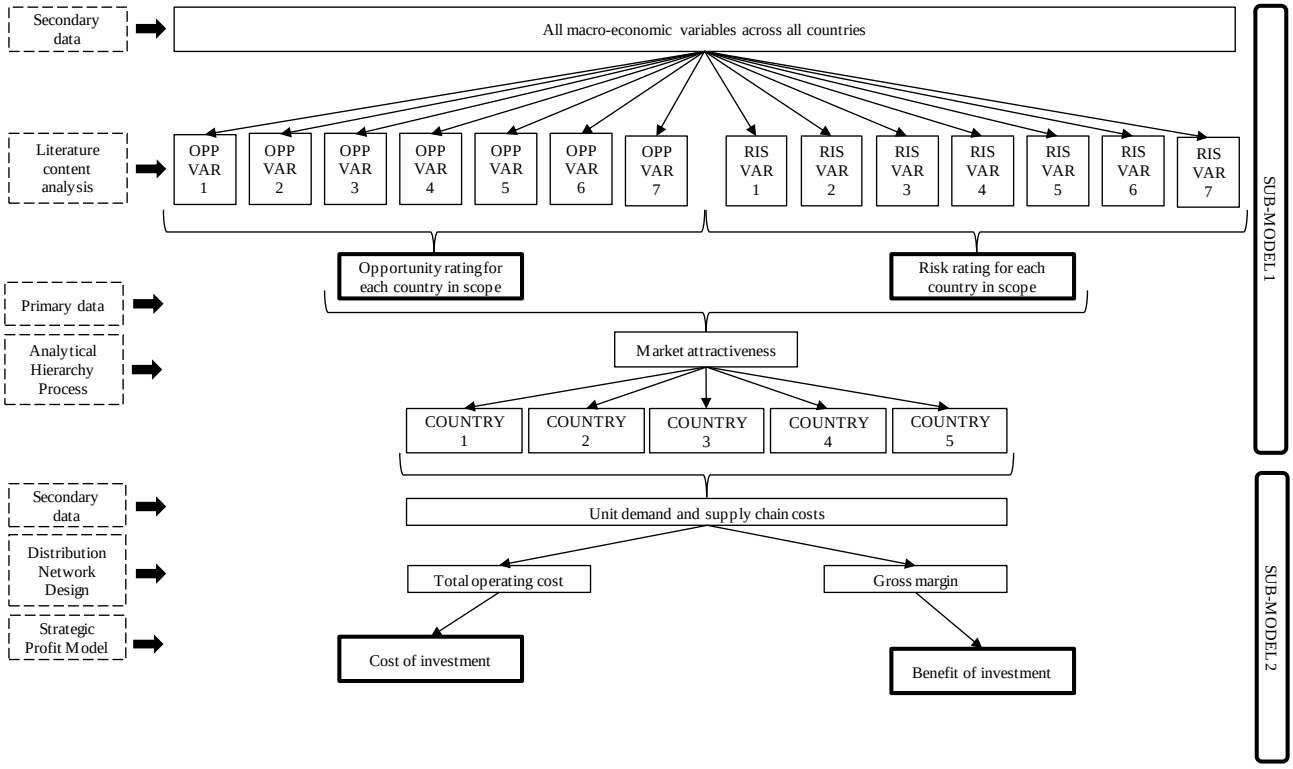

Figure 5-26: The final proposed decision-support model

The four main constructs evolving from the proposed model (‘opportunity’, ‘risk’, ‘benefit’, and ‘cost’) can now be plotted against one another for a holistic comparison of countries considered during the investment decision-making process.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

It is believed that many South African retailers decide to enter foreign African markets on the basis of ill-informed opinion, and that their decisions are not necessarily backed by scenario analysis, empirical data, or rigorous decision-support models. A reason for this could be that rigorous scenario analysis is complex, time-consuming, and costly – and, more than that, foreign investment models would contain a large amount of uncertainty in their input variables. The originality of the research scope of this study adds to the current body of knowledge – not only academically, but also in consulting practice – where there is a gap in academic research on how South African retailers can make well-informed decisions about expansion into foreign Sub-Saharan African markets: selecting which market to enter next, the opportunity that the market holds, the potential risks to consider, and the financial benefits and costs of the investment.

6.1 RESEARCH QUESTIONS ANSWERED

The research objective is summarised in 1.2.2 as finding answers to the four main research questions listed below (based on the four main constructs of opportunity, risk, benefit, and cost) within the time and resources available to complete a Master's thesis. Each of the four research questions is constructed around the research aim of synthesising a strategic decision-support model to assist a South African retailer during expansion into Sub-Saharan African markets.

a) What quantitative variables need to be included in a strategic decision-support model?
b) What qualitative variables need to be included in a strategic decision-support model, and how are they to be converted into measurable variables?
c) What tools and techniques can be applied to include all the identified qualitative and quantitative variables in a single decision-support model?
d) Does the decision-support model represent the investment decision with a good level of confidence, given the opportunity, risk, benefit, and cost involved?

The research questions are successfully answered through the research conducted in this thesis, and the findings of each are discussed in the paragraphs that follow.

6.1.1 Research question 1: What quantitative variables need to be included in a strategic decision-support model?

Multiple variables can impact the financial returns resulting from an investment decision. By taking a distribution network design approach, it becomes clear which variables are critical for inclusion in a decision-support model. The inputs required by the model are listed (in no particular order) as being annual estimated unit demand, cost of goods sold, inbound transportation cost (including cost of importing), outbound distribution transportation cost, other operational costs, and total assets (fixed and current).

Using a basic strategic profit model, various ratios can be calculated from the inputs listed above. These ratios are useful for making a well-informed investment decision, such as those for gross margin, total operating cost, net income, net profit margin, and return on assets (or return on investment).

6.1.2 Research question 2: What qualitative variables need to be included in a strategic decision-support model, and how are they to be converted into measurable variables?

A rigorous literature review is undertaken to identify all the qualitative variables that should be included in a holistic decision-support model for foreign market expansion. Through an iterative process of refining literature samples, the research presents two main focus areas of qualitative variables: 'opportunity' variables, and 'risk' variables. From the findings, a list is produced of 7 macro-economic variables that represent well the opportunity for foreign market expansion by a retailer. These are listed (in no particular order) as being gross domestic product (GDP), the annual growth rate of GDP, the annual growth rate of the size of the population, the size of foreign direct investment, the perceived competitiveness of the country, GDP *per capita*, and the size of the population in urban regions.

Another list is compiled to identify 7 macro-economic variables that represent well the risk that retailers face when entering a foreign market. These are listed (in no particular order) as being adult literacy rate, ranking on the Corruption Perceptions Index, degree of economic freedom, degree of corporate governance, ranking on the Logistics Performance Index, distance to frontier for trading across borders, and ranking on the Ease of Doing Business Index.

Secondary data is available on a country level for each of the 14 variables. To test the model, the most recent data points are collected for each of the Sub-Saharan countries in the scope of the research context. The data is 'cleaned', and data gaps are filled by using weighted averages across geographical regions where data points are missing. The data points are now standardised through a technique called 'data scaling'. This is a statistical conversion by which each variable is scaled to have its data points range on a relative scale of 1 to 10 to ensure that the data sources are now comparable with one another. In this way, qualitative variables are converted into quantitative variables.

6.1.3 Research question 3: What tools and techniques can be applied to include all the identified qualitative and quantitative variables in a single decision-support model?

Industrial engineering tools and techniques are available for constructing a simple and easy-to-use strategic model to assist retailers with foreign market expansion decisions. From a literature review, it becomes clear that the application of systems thinking is vital for taking a holistic approach during the complex decision-making process. This systems thinking approach leads to the combination of a list of tools and techniques that are most apt for building a decision-support model, including Microsoft Excel applications, the

Analytical Hierarchy Process, a supply chain distribution network design, Monte Carlo simulation, sensitivity analysis, what-if analysis, and the strategic profit model. Each of the tools is integrated in the final proposed decision-support model, providing stakeholders with a simplified approach to a complex investment decision.

6.1.4 Research question 4: Does the decision-support model represent the investment decision with a good level of confidence, given the opportunity, risk, benefit, and cost involved?

During research design, a modelling approach is suggested that combines all the tools and techniques that have been identified as useful in making a holistic and well-informed expansion decision. The final strategic model consists of two sub-models. Sub-model 1 is constructed to determine the market opportunity and the risk of foreign market entry for each Sub-Saharan African country in the scope of the study. Sub-model 1 is depicted in Figure 6-1, and is based on approaches derived from systems thinking and form the analytical hierarchy process.

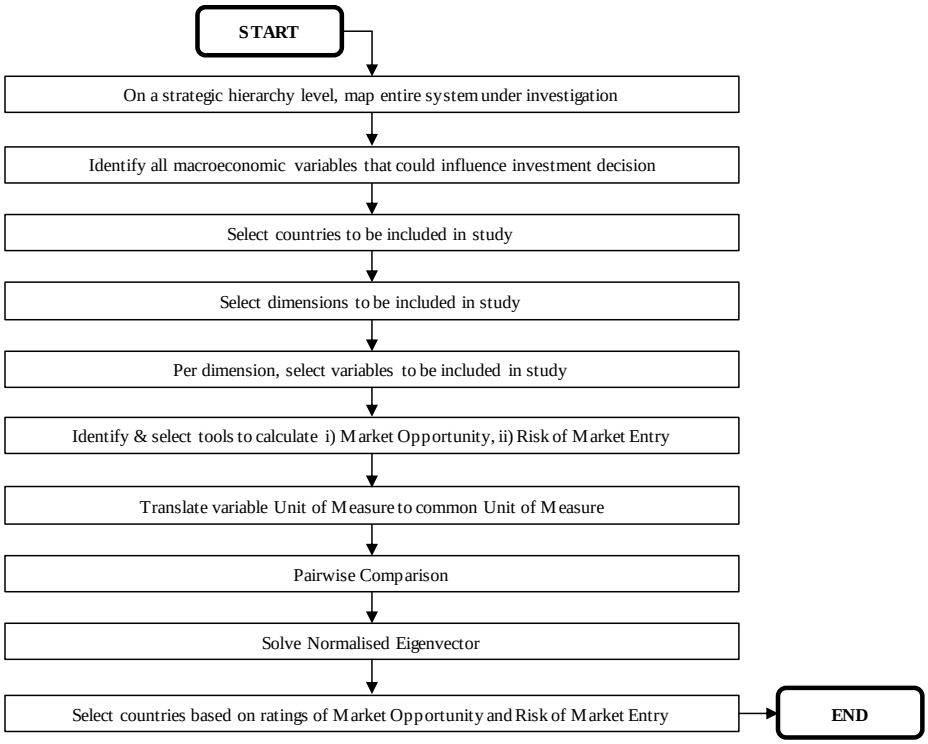

Figure 6-1: Final proposed decision-support model: Sub-model 1

By consistently taking a systems thinking approach, the system is mapped on a strategic level. Thereafter, an exhaustive list is compiled of all macro-economic input variables that could possibly have an impact on the market opportunity or risk of foreign market entry. By using the identified tools and techniques, the final selection of macro-economic input variables is now converted into two final outputs: the market opportunity and the risk of investing in the market. Secondary data points are collected for each input variable in the final list, and each unit of measure is converted into a common unit of measure that would enable the variables to

be compared against one another. Through correlation analysis and analytical hierarchy process (AHP), a rating is assigned that represents the 'opportunity' and 'risk' of foreign market expansion into each country.

By assigning an 'opportunity' and 'risk' rating to each country, an informed decision can be made about which countries should be further investigated, based on having a combination of the highest market attractiveness and lowest perceived risk of investment.

A case study is conducted to validate sub-model 1, with an intentional sample of subject matter experts (SMEs) from the South African retail industry. From the results of the Analytical hierarchy process, it is concluded that the participants in the case study consider the variable of GDP growth as the most important 'opportunity' variable to take into consideration during foreign market expansion. GDP growth is thus assigned the greatest weight (of 24 per cent) for further calculation of the market attractiveness of the various Sub-Saharan African countries. The second-highest weight is assigned to the variable of GDP *per capita* at 22 per cent, then the variable for FDI inflow at 13 per cent. Furthermore, it is concluded that the participants consider the 'risk' variable representing the 'ease of doing business' as the most important (with a weight of 19.3 per cent). The second-highest weight is assigned to the 'risk' variable that indicate prevalence of corruption at 19.2 per cent, then the variable that measures the logistics performance (at 14 per cent).

Using these weighted variables as inputs, the results are tested against the macro-economic secondary data collected for each of the variables. The results of the case study estimated that the following Sub-Saharan African countries having the highest results for market attractiveness (based on data points collected in 2016 and 2017): Nigeria, Tanzania, Angola, Gabon, Ghana, and Ethiopia.. These countries are identified as being favourable for market expansion.

Next, sub-model 2 is developed by combining the following tools and techniques: distribution network design, Monte Carlo simulation, a strategic profit model and benefit-cost analysis. By combining these two tools, outputs are generated that provide stakeholders with the benefit and cost implications that each strategic decision scenario under consideration would have for the supply chain. Sub-model 2 is presented in Figure 6-2.

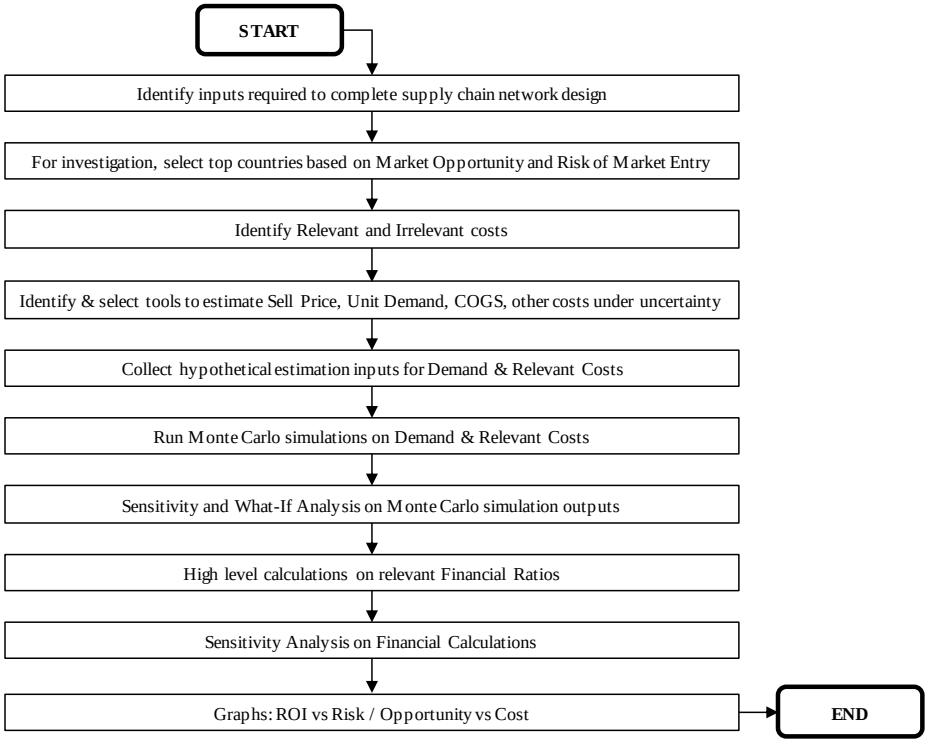

Figure 6-2: Final proposed decision-support model: Sub-model 2

The quantitative inputs required for the completion of a distribution design network is identified as: the total unit demand and sell price per unit (which equates to total sales); the cost of goods sold; total operating cost (including inbound and outbound transportation costs, and other operating costs); final gross margin as an indicator of profitability; and lastly, the return on assets or return on investment to quantify the final impact of the investment decision.

The supply chain network design generates the following outputs: a total estimation of sales; the cost of goods sold; inbound and outbound transport costs; and all other operational costs. By using these variables as inputs into a strategic profit model, important financial ratios are calculated that give valuable insights into the potential benefits and costs of each scenario under consideration. The outputs from the network design are used as inputs to the strategic profit model, to calculate basic financial ratios. The profit margin and return on assets are calculated with a strategic profit model, and these are considered to represent well the benefits and costs of each investment scenario under consideration.

Figure 6-3 is a depiction of the final decision-support model, by combining sub-models 1 and 2.

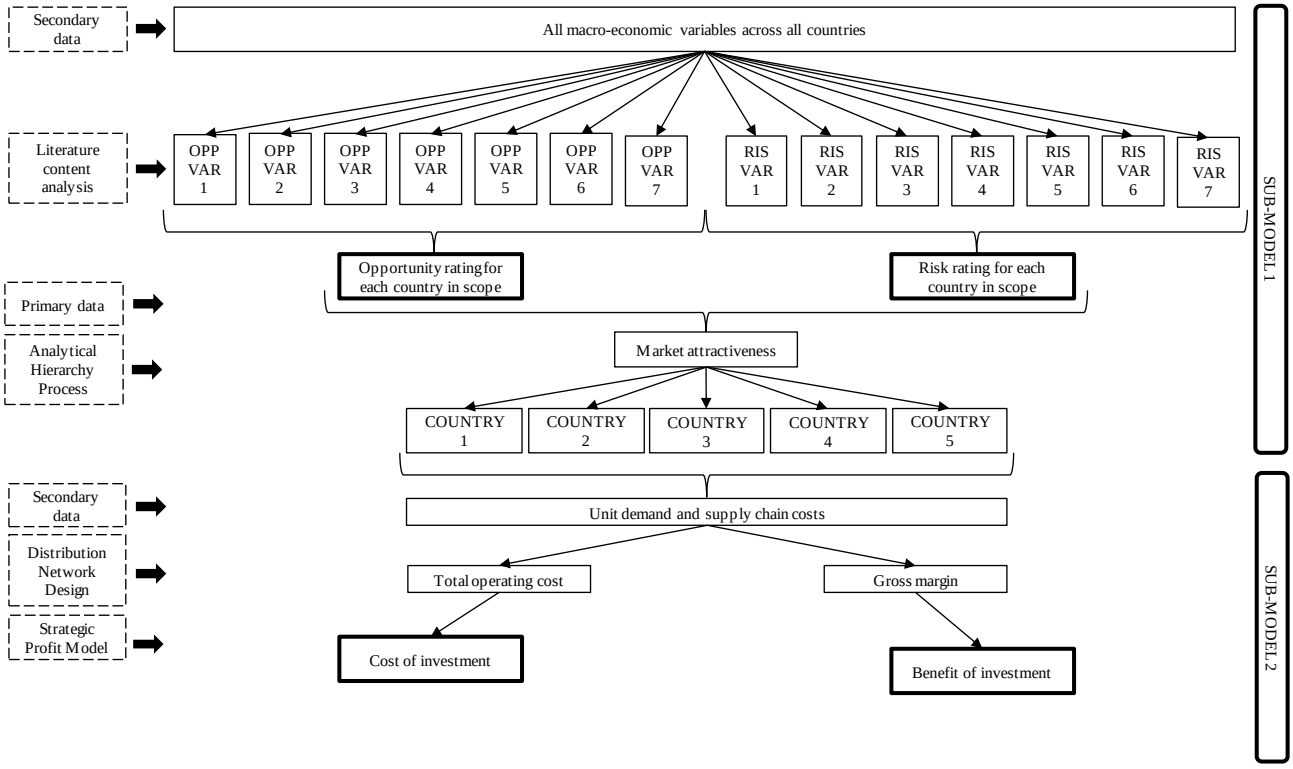

Figure 6-3: The final proposed decision-support model

6.2 MODEL LIMITATIONS

Prior to the actual construction of the model, the research methodology in Chapter 3.3 listed potential shortcomings and sources of error that are expected during model build. These identified limitations include the hybrid use of quantitative and qualitative research methodologies, which leads to an overarching qualitative approach (which potentially falls short of the desired level of rigour required for scientific research); the potential risk of errors when collecting data points from secondary sources; the complexity behind statistical analysis and simulation modelling; and the potential overestimation of the accuracy of the model as an idealised representation of the real world. Furthermore, it is noted that a small sampling selection is used for testing the model with a case study; and, lastly, the limited time, resources, and knowledge available in the scope of a Master's thesis is listed as one of the research constraints.

These limitations and sources of error are taken into consideration during model synthesis, and steps are taken to minimise their risk. Using a hybrid of quantitative and qualitative methods was found to be helpful in addressing a very complex problem, and techniques such as data scaling and analytical hierarchy process have proven successful in converting qualitative samples into quantitative data points for further analysis. Errors in secondary data collection are minimised by collecting data from well-known global organisations that are viewed as reliable data sources and are referenced across many scholarly studies. For the collection of the macro-economic data of Sub-Saharan African countries, the sample selection of more than 40 units is deemed large enough to make statistical deductions with minimal risk. The only country that has many

missing data points is Sudan, and so it is removed from the sample selection for the purpose of this study. For the case study used to test the analytical hierarchy process, a purposive sampling method is used to select very specific individuals to complete the questionnaires. This case study merely plays a supportive role to the research objective, and is not seen as the main aim of the statistical analysis.

After constructing the proposed model and testing it using secondary data and a case study, final conclusions are drawn on the model's limitations that are recognised as being noteworthy and important for consideration when recreating the model. The greatest limitations of sub-model 1 and sub-model 2 are discussed below.

6.2.1 Shortcomings of sub-model 1

For sub-model 1, the date of data collection will influence the validity and relevance of the model. To recreate the proposed model, the most recent data findings and technical reports must be investigated to ensure that the qualitative variables included in the model are the best representation of 'opportunity' and 'risk' (in context of the current economic climate).

The variables selected are highly dependent on the industry selected for the scope and context of this study (stipulated in Chapter 1.1 as being a South African clothing or apparel retailer looking to expand business into other Sub-Saharan countries). If this model is applied to a different industry (such as the grocery retail, mining, automotive, banking, energy, technology, or healthcare industries), the variables considered to represent well 'opportunity' and 'risk' could look drastically different.

As the constructs of 'opportunity' and 'risk' are qualitative variables, this sub-model should still be considered as being qualitative, even though all variables are converted and scaled to be presented in a quantitative manner. This could be misleading, and stakeholders should bear in mind that no model is fully accurate, but is merely a tool to support the decision-making process. 'Opportunity' and 'risk' ratings should be viewed and compared simultaneously across countries, and should not be viewed in isolation. It is important to view the outputs from sub-model 1 as a guideline for scenario selection in sub-model 2.

6.2.2 Shortcomings of sub-model 2

A critical step in completing sub-model 2 is the selection of scenarios to consider for further analysis. With enough time and resources, an endless list of scenarios could be modelled using the supply chain network design approach. It is within the discretion of the decision-making stakeholders to consider carefully the output from sub-model 1 in selecting the best countries to use as scenarios in sub-model 2. Network simulation could be a costly and tedious process, but it is highly recommended to make well-informed strategic investment decisions.

The sensitivity of the network model cannot be tested, since a full simulation is not being conducted, and the mathematics of such a simulation fall outside the scope of this study. An in-depth understanding of the modelling software is required to complete such a network design and data collection successfully, and

cleaning is of critical importance for building the correct baseline model and testing various scenarios. This is not a simple process, and retailers generally approach consultants with expertise in this field to assist them.

For the use of the strategic profit model, a very high-level isolated view is taken of the impact of opening one distribution centre and ten stores on the 'return on assets' ratio. In reality, a company's entire income statement and balance sheet must be considered to ensure that an outcome is selected that makes business sense for the entire company, and not just for the supply chain department making one investment decision.

6.3 SUGGESTED FUTURE RESEARCH

The shortcomings and limitations identified in Chapter 6.2 suggest potential future research on this research topic. There is ample opportunity for scholars to expand on the use of various industrial engineering tools and techniques in the complex decision-making process of foreign market expansion. As this study gives a high-level strategic overview of an input-output model, each of the input and output variables can be studied in further detail by conducting literature summaries, analysing the content of technical papers, and analysing secondary data collected by organisations and institutes that focus on this topic in the industry, but are not yet published as findings in academic journals.

More detailed statistical analysis can be completed on the secondary data collected on macro-economic variables, such as an investigation of the statistical correlation of each macro-economic variable, and sensitivity analysis when more variables are added to the model. As this study uses the most recent data points collected to the date of research initiation, there is no focus on historical data or on its use for projecting data points as a forecast.

Further research can be conducted on applying this model concept to various industries. As the opportunity and risk of a market are highly dependent on the view and context of the stakeholder making the expansion decision, it can be expected that variable outcomes would look different for an industry other than clothing retail.

More case studies can be conducted to test the sub-sections of the model. Countries other than those in Sub-Saharan Africa could be investigated, and different supply chain scenarios could be simulated to test the validity of the model in different scopes and contexts.

6.4 CONCLUDING REMARKS

Macro-economic data shows that many African countries have experienced an improvement in factors such as GDP, labour productivity, democracy, infrastructure, foreign direct investment, and job creation, and a decline in foreign debt and inflation, over the past 10 years. Combined with an increase in urbanisation and an expanding middle class (with higher disposable income), many African countries are now in a position to

attract potential foreign investors, especially in the consumer products and retail sector. The emerging Sub-Saharan African markets are seen a window-opportunity for expansion, and as the local South African retail market is becoming saturated with increasing levels of competition, large retailers are gradually experiencing more pressure to expand their footprint into other emerging African markets. Foreign investors find emerging markets attractive, as evidenced by the fact that emerging market economies account for more than half of current global foreign direct investment.

Foreign market expansion is a business decision that requires a structured analytical framework to assist in the decision-making efforts of potential foreign investors. Models can be synthesised to assess and prioritise which market, country, or region to enter next; and what the opportunities and risks of such a move will be. A decision on foreign market expansion cannot be based solely on the variables of market opportunity and risk involved in the expansion process; the potential monetary benefits and costs need also be quantified and taken into consideration.

This thesis has achieved the research objective of synthesising a strategic decision-support model for a South African retailer that is looking to expand its business into markets in Sub-Saharan Africa by taking a holistic approach that covers various disciplines, including supply chain management, economics of development, and financial management. The study identifies the qualitative and quantitative variables that should be considered during foreign market expansion, and combines various industrial engineering tools and techniques to present a strategic decision-support model based on the four key constructs of ‘opportunity’, ‘risk’, ‘benefit’, and ‘cost’.

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APPENDIX A: LITERATURE REVIEW VARIABLES

Appendix A contains the exhaustive list of macro-economic variables identified during the literature review (as referred to in Chapter 4.1.2). A description of each variable is provided, as well as an indicator of whether it is a soft, medium, or hard variable. ('Soft' variables have no quantitative data readily available; 'hard' variables have a clearly defined quantitative unit of measure and secondary data readily available, whereas 'medium' variables are quantitative values, but the unit of measure is not necessarily in monetary terms, like a UOM of years or rankings from in index.)

Table 7-1: Each variable, its assigned research code, unit of measure and description

CODE	MEASURE / DIMENSION	VARIABLE AND UOM	DESCRIPTION OF VARIABLE
AFRRETAILDEV	MARKET GROWTH RATE	African Retail Development Index	The increase of the size of retail expenditure in a country. (African Retail Development Index ranks the top 15 countries in a market, but does not provide secondary data for all Sub-Saharan
AGEDISTRIBUTE	DEMOGRAPHICS	Distribution by age (%) 2015	Age distribution for categories 0 to 14, 15 to 64, 65 +
BANDWIDTH	ACCESS TO SERVICES	International Internet Bandwidth (2013)	The % of households that have access to a certain level of internet bandwidth.
BRANDRECOG	SOFT VARIABLES: MARKET RECEPTIVITY	Brand Recognition	Does the multinational entry company have to adjust their brand to fit into the cultural-sprecific-context? How important do the locals view brand loyalty?
BROADMONEY	BASIC ECONOMIC & MONETARY INDICATORS	Broad Money (LCU) 2015	A country's total money in any form, including bank or other deposits as well as notes and coins.
BUYSOPHISTIC	SOFT VARIABLES: MARKET RECEPTIVITY	Consumer involvement / buyer sophistication	The level at which consumers make reasoned purchasing decisions, process brand information, how concerned they are about consuming goods and promotional activities, trying new products or switching brands.
CAGRGDP	MARKET GROWTH RATE	Compound Annual Growth Rate (CAGR) of GDP (constant 2005 US$)	The progression rate at which GDP provides a constant rate of return over a historical period of time.
CELLMOBILE	ACCESS TO SERVICES	Cellular Mobile Subscribers (2014)	The number of cellular subscribers in a country.
COMMODITY	BASIC ECONOMIC & MONETARY INDICATORS	Current Oil & Other Commodity Prices	Current Oil & Other Commodity Prices.
COMPETITIVE	DIVERSIFICATION, COMPETITIVENESS AND FDI	Competitiveness Indicator 2010-14(%)	Indicator of an economy's resilience. Based on 12 pillars: Institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, labour market efficiency, financial market development,
CONSUMEXPEND	DEMAND COMPOSITION	Consumer Expenditure	Consumer spending, consumer demand, consumption, or consumption expenditure is the purchasing of goods and services by individuals or families. It is the largest part of aggregate demand at the macroeconomic level.
CONSUMSHARE	PROSPERITY AND INCOME DISTRIBUTION	Share of consumption (%)	Consumption share for the lowest and highest 10% of the population.
CORRUPT	RISK RATINGS	Corruption Perceptions Index 2013-15	Perceptions of the degree of corruption as seen by business people and country analysts, and ranges between 10 (clean) and 0 (corrupt).
COUNTRYRISK	RISK RATINGS	International Country Risk Rating	The ICRG is a business-venture risk rating system, whereby a number value is attached to a foreign country by an independent collaborative group after many determining factors are
CUSTDEMAND	DEMAND COMPOSITION	Customer Demand Potential Index	The potential that a market holds in view of consumer expenditure.
DEMCAPFORM	DEMAND COMPOSITION	Gross Capital Formation (Private and Public) 2014, 2015 (e), 2016 (p)	Gross fixed capital formation (GFCF) refers to the net increase in physical assets (investment minus disposals) within the measurement period.
DEMCONSUMP	DEMAND COMPOSITION	Final consumption 2014, 2015 (e), 2016 (p)	Consumption demand is determined by disposable income. Household final consumption expenditure is the market value of all goods and services, including durable products (such as
DEMOPOTENT	POLITICS AND GOVERNANCE	Demographic Potential Index	Demographic potential is an aggregate index related to ultimate posterity of the population. It reflects the demographic power of the nation, its ability to provide future population growth.
DEPENDRATIO	DEMOGRAPHICS	Dependency Ratio	Proportion of children & elderly in a population. (A higher dependency ratio means working population will have fewer resources to save and spend).
DISPINCOMEMID	DEMAND COMPOSITION	Household Annual Disposable Income of Middle-Class (2014)	Disposable income, also known as disposable personal income (DPI), is the amount of money that households have available for spending and saving after income taxes have been
DIVERSIFI	DIVERSIFICATION, COMPETITIVENESS AND FDI	Exports Diversification index 2014	The change in a country's export structure, as the increase or decrease of export activity in the recent past.

CODE	MEASURE / DIMENSION	VARIABLE AND UOM	DESCRIPTION OF VARIABLE
FDIINFLOW	DIVERSIFICATION, COMPETITIVENESS AND FDI	FDI Inflows per historical year	FDI net inflows are the value of inward direct investment made by non-resident investors in the reporting economy.
GDP	BASIC ECONOMIC & MONETARY INDICATORS	GDP based on PPP valuation (USD Million)	Real Gross Domestic Product (GDP) is the market value of all final goods and services produced in an economy during a year adjusted for inflation. GDP is the most comprehensive measure
GDPGROW	MARKET GROWTH RATE	Annual real GDP growth (average over 2008-2016)	The average historical rate with which a country's GDP increased or decreased.
GENDERRATIO	DEMOGRAPHICS	Gender ratio (males per 100 females)	The ratio of males to females in a population.
GEODIFF	GEOGRAPHIC DISTANCE	Physical distance from host country	Not only the physical distance (km) from the host country, but also the quality of logsitics and infrastructure available for transporting goods (roads, ports and airports).
GINICOEFF	PROSPERITY AND INCOME DISTRIBUTION	Gini coefficient	Based on income distribution; the Gini coefficient is a measure of the degree of variation represented in a set of values, when analysing income inequality.
GOVERNANCE	POLITICS AND GOVERNANCE	Ibrahim Index of African Governance	Governance is the provision of the political, social and economic goods that any citizen has the right to expect from his or her state, and that any state has the responsibility to deliver to its citizens.
GPD/CAP	BASIC ECONOMIC & MONETARY INDICATORS	GDP per Capita (PPP valuation)	The total GDP output divided by the number of people in the population, (i.e. the average amount of money each person makes). Disposable income is defined as national income (GNP)
HEALTHEXPEND	ACCESS TO SERVICES	Total health expenditure 2013	A country's total public expenditure on the provision of health services.
IMPORTABILITY	POLITICS AND GOVERNANCE	Ability to import product groups	The ease with which certain product groups are traded across a country's borders.
IMPORTCOST	BASIC ECONOMIC & MONETARY INDICATORS	Import duty costs	Total cost of import procedures and duties.
IMPORTLEAD	INFRASTRUCTURE	Lead time to import, median case (days)	Total lead time from port to final warehouse, as embedded in Logistics Performance Index.
INACTIVITY	EMPLOYMENT	Inactivity rate (age 15-64) 2013	The proportion of the population that is not in the labour force.
INCOMEMID	DEMAND COMPOSITION	Income Share of Middle-Class	The final share of a country's income per individual.
INFLATION	BASIC ECONOMIC & MONETARY INDICATORS	Inflation (%)	The general increase in prices and fall in the purchasing value of money.
INFMORTALITY	DEMOGRAPHICS	Infant mortality rate (per 1000)	Number of deaths under one year of age occurring among the live births in a given geographical area during a given year.
INTERNET	ACCESS TO SERVICES	Internet users per 100 inhabitants	Total number of Internet users in a population.
INTLPOVERTY	PROSPERITY AND INCOME DISTRIBUTION	Population below the international poverty line (%)	% of the total population below the international poverty line.
LABOURCOST	EMPLOYMENT	Cost of Labour	Average labour cost per general worker.
LANDSIZE	BASIC ECONOMIC & MONETARY INDICATORS	Land Area	Physical geographic size of the country.
LCU/USD	BASIC ECONOMIC & MONETARY INDICATORS	Exchange Rate (LCU / USD)	Local Currency Unit exchange rate to the US Dollar.
LCU/ZAR	BASIC ECONOMIC & MONETARY INDICATORS	Exchange Rate (LCU / ZAR)	Local Currency Unit exchange rate to the South African Rand.
LIFEEXPECT	ACCESS TO SERVICES	Life expectancy at birth (years)	Expected number of years a person is expected to live, based on historical statistics.
LITERACYADULT	ACCESS TO SERVICES	Estimated adult literacy rate, 2010-15 (people over 15)	% of population aged 15 years and over who can both read and write with understanding a short simple statement on his/her everyday life. Generally, 'literacy' also encompasses
LITERACYYOUTH	ACCESS TO SERVICES	Estimated youth literacy rate, 2010-15	% of population bwteen the age of 15-24 who can both read and write with understanding a short simple statement about their everyday life.
LOGPERFINDEX	INFRASTRUCTURE	Logistics Performance Index	A scorecard based on factors such as efficiency of border and customs processes, quality of physical infrastructure, competence of logistics services and supply chain reliability.
MIDCONSGROW	MARKET GROWTH RATE	Growth of Middle Consumer Class	Growth rate of population considered to move from poverty into a "middle class". Middle class households are typically defined as those that spend at least half of their income on goods and
MORTALUNDER5	DEMOGRAPHICS	Mortality under age 5 (per 1000)	Number of deaths under 5 years of age occurring in a given geographical area during a given year.
NEWLABOUR15	EMPLOYMENT	Yearly cohort of new labour entrants, 2015	Annual cohort of new labour entrants based on historical data.
NOURISH	ACCESS TO SERVICES	Prevalence of undernourished in total population (%)	% of population considered to be undernourished.
NUMBERPCS	ACCESS TO SERVICES	Number of PC's (2014)	Estimated number of PC's being used by total population in a given year.
PARTICIPATE	EMPLOYMENT	Participation rate 2013	Number of individuals in a population who are either employed or are actively looking for work. Inverse of inactivity rate.
POLITFREEDOM	POLITICS AND GOVERNANCE	Political Freedom Index (2015)	Analyzes the electoral process, political pluralism and participation, the functioning of the government, freedom of expression and of belief, associational and organizational rights, the rule of law, and personal autonomy and individual rights.
POLITICALRISK	RISK RATINGS	Political Risk Rating (2015)	Countries are classified into seven categories (from 1 to 7) reflecting the intensity of risks arising as a result of political and assimilated events.
POPDENSE	DEMOGRAPHICS	Population Density	Population size per km2.

CODE	MEASURE / DIMENSION	VARIABLE AND UOM	DESCRIPTION OF VARIABLE
POPGROW	DEMOGRAPHICS	Population growth rate (per 1000)	The rate with which the population size increases or decreases over an annual period.
POPPERRETAIL	INFRASTRUCTURE	Population per Retail Outlet (2014)	Estimated number of consumers within radius of retail outlets. Density of individuals per retail outlet.
POPSIZE	BASIC ECONOMIC & MONETARY INDICATORS	Population size	Number of people in the country.
POPURBAN	DEMOGRAPHICS	Urban population	Size of the population living in areas defined as being Urbanized (as opposed to Rural).
PSYCHICDIST	SOFT VARIABLES: MARKET RECEPTIVITY	Psychic distance	The differences in language, education, managerial practice, culture and industrial development experienced between a host and foreign market.
PUBLICTRANS	ACCESS TO SERVICES	Public Transport Accessibility	Access to public transport infrastructure.
REV&GRANTS	BASIC ECONOMIC & MONETARY INDICATORS	Total revenue and grants 2014, 2015 (e), 2016 (p)	Public finance variable of an economy's total revenue and grants in a given year.
SANITATION	ACCESS TO SERVICES	Sanitation coverage (%) 2013 (Urban, Rural and Total)	The % of households that have access to sanitation services in a given year.
TOTALFERTILITY	DEMOGRAPHICS	Total fertility rate (per woman)	The number of children who would be born per woman if she/they were to pass through the childbearing years bearing children according to a current schedule of age-specific fertility
TRADEBORDER	POLITICS AND GOVERNANCE	Ease of Trading Across Borders	An indicator that forms part of the Ease of Doing Business index. This variable measures the distance to frontier for ease of trading across a aspecific country's borders.
TRADEPERCGDP	DEMAND COMPOSITION	Trade as a Percentage of GDP (2014)	Public finance variable of total annual trade as a % of GDP.
UNEMPLOY	EMPLOYMENT	Unemployment rate 2013	The prevalence of unemployment as a percentage, by dividing the number of unemployed individuals by all individuals currently in the labor force.
URBPOPINCR	MARKET GROWTH RATE	Projected urban population increase, 2015-50	The future projected increase of population living in urban areas.
URBPOVERTYLINE	PROSPERITY AND INCOME DISTRIBUTION	URBAN Population below the poverty line (%)	% of the population residing in urban areas who are living under the poverty line.
WATERURB	ACCESS TO SERVICES	Water supply coverage (%) 2013 (Urban, Rural and Total)	The % of households that have access to a safe water supply.

Table 7-2 shows each variable from the exhaustive list, its measure of rigour ('hard' or 'soft'), secondary data source where available, an indicator of whether the variable is included in the final selection (after content analysis is completed), and the reason for exclusion where required.

Table 7-2: Variables, degree of rigour and data sources

CODE	HARD vs SOFT	Secondary data availab	Secondary data source	Include in mod	Reason for exclusion
AFRRETAILDEV	Medium	N	#N/A	N	No secondary data publically available
AGEDISTRIBUTE	Hard	Y	African Economic Outlook	Y	Included
BANDWIDTH	Medium	Y	#N/A	N	Another variable is available that gives a better representation of the construct and data outdated.
BRANDRECOG	Soft	N	#N/A	Y	Included
BROADMONEY	Hard	Y	African Economic Outlook	N	Another variable is a better representation of the construct of Economic Prosperity.
BUYSOPHISTIC	Soft	N	#N/A	N	Soft variable / No secondary data available
CAGRGDP	Hard	Y	Worldbank.org	N	Another variable is available that gives a better representation of the construct
CELLMOBILE	Hard	Y	ITU.int	N	Another variable is available that gives a better representation of the construct
COMMODITY	Hard	Y	World Bank Commodity Price Data	N	Another variable is available that gives a better representation of the construct

CODE	HARD vs SOFT	Secondary data availab	Secondary data source	Include in mod	Reason for exclusion
COMPETITIVE	Medium	Y	The Global Competitiveness Report (World Economic Forum)	Y	Included
CONSUMEXPEND	Hard	Y	Euromonitor.com	N	Another variable is available that gives a better representation of the construct
CONSUMSHARE	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
CORRUPT	Medium	Y	Transparency.org	Y	Included
COUNTRYRISK	Medium	Y	prsgroup.com	N	Another variable is available that gives a better representation of the construct
CUSTDEMAND	Medium	N	#N/A	N	No secondary data publically available
DEMCAPFORM	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
DEMCONSUMP	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
DEMOPOTENT	Medium	N	#N/A	N	No secondary data publically available
DEPENDRATIO	Medium	N	0	N	Another variable is available that gives a better representation of the construct
DISPINCOMEMID	Hard	Y	Euromonitor.com	N	Another variable is available that gives a better representation of the construct; Data not available for large enough sample selection in scope.
DIVERSIFI	Medium	Y	#N/A	N	Another variable is available that gives a better representation of the construct
EASEBUSINESS	Medium	Y	Doingbusiness.org	Y	Included
ECONOFREEDOM	Medium	Y	Heritage.org	Y	Included
EDUEXPEND	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
ELECTRICITY	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
EXP&IMP	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
EXPEND&LEND	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
EXPKNOWLEDGE	Soft	N	#N/A	N	Soft variable / No secondary data available
EXPORTGROW	Hard	Y	#N/A	N	Another variable is available that gives a better representation of the construct.
FDIINFLOW	Hard	Y	African Economic Outlook	Y	Included
GDP	Hard	Y	African Economic Outlook	Y	Included
GDPGROW	Hard	Y	African Economic Outlook	Y	Included
GENDERRATIO	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
GEODIFF	Medium	N	#N/A	N	Another variable is available that gives a better representation of the construct
GINICOEFF	Medium	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
GOVERNANCE	Medium	N	Mo Ibrahim Foundation	Y	Included

CODE	HARD vs SOFT	Secondary data availab	Secondary data source	Include in mod	Reason for exclusion
GPD/CAP	Hard	Y	African Economic Outlook	Y	Included
HEALTHEXPEND	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
IMPORTABILITY	Soft	N	#N/A	N	Soft variable / No secondary data available
IMPORTCOST	Medium	N	#N/A	N	Another variable is available that gives a better representation of the construct
IMPORTLEAD	Medium	Y	data.worldbank.org	N	Another variable is available that gives a better representation of the construct
INACTIVITY	Medium	Y	#N/A	N	Another variable is available that gives a better representation of the construct
INCOMEMID	Hard	Y	datacatalog.worldbank.org	N	Another variable is available that gives a better representation of the construct
INFLATION	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
INFMORTALITY	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
INTERNET	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
INTLPOVERTY	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
LABOURCOST	Medium	Y	Trading Economics website	N	Another variable is available that gives a better representation of the construct
LANDSIZE	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
LCU/USD	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
LCU/ZAR	Hard	Y	#N/A	N	Another variable is available that gives a better representation of the construct
LIFEEXPECT	Hard	Y	African Economic Outlook	Y	Included
LITERACYADULT	Medium	Y	African Economic Outlook	Y	Included
LITERACYYOUTH	Medium	Y	#N/A	N	Another variable is available that gives a better representation of the construct
LOGPERFINDEX	Medium	Y	lpi.worldbank.org	Y	Included
MIDCONSGROW	Medium	N	#N/A	N	Another variable is available that gives a better representation of the construct; Data not available
MORTALUNDER5	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
NEWLABOUR15	Medium	Y	African Economic Outlook	Y	Included
NOURISH	Medium	Y	#N/A	N	Another variable is available that gives a better representation of the construct
NUMBERPCS		Y	#N/A	N	Another variable is available that gives a better representation of the construct
PARTICIPATE	Medium	Y	#N/A	N	Another variable is available that gives a better representation of the construct
POLITFREEDOM	Medium	Y	Freedomhouse.org	N	Another variable is available that gives a better representation of the construct
POLITICALRISK	Medium	Y	prsgroup.com	N	Another variable is available that gives a better representation of the construct
POPDENSE	Hard	Y	African Economic Outlook	Y	Included

CODE	HARD vs SOFT	Secondary data availab	Secondary data source	Include in mod	Reason for exclusion
POPGROW	Hard	Y	African Economic Outlook	Y	Included
POPPERRETAIL	Hard	N	#N/A	N	No secondary data publically available
POPSIZE	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
POPURBAN	Hard	Y	African Economic Outlook	Y	Included
PSYCHICDIST	Soft	N	#N/A	N	Soft variable / No secondary data available
PUBLICTRANS	Soft	N	#N/A	N	Soft variable / No secondary data available
REV&GRANTS	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
SANITATION	Hard	Y	#N/A	N	Another variable is available that gives a better representation of the construct
TOTALFERTILITY	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
TRADEBORDER	Medium	Y	Doingbusiness.org	Y	Included
TRADEPERCGDP	Hard	Y	datacatalog.worldbank.org	N	Another variable is available that gives a better representation of the construct
UNEMPLOY	Medium	Y	#N/A	N	Another variable is available that gives a better representation of the construct
URBPOPINCR	Medium	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
URBPOVERTYLINE	Hard	Y	African Economic Outlook	N	Another variable is available that gives a better representation of the construct
WATERURB	Hard	Y	African Economic Outlook	Y	Included

After content analysis has been conducted, 10 variables are selected as being well representative of market opportunity, and 10 more variables as being well representative of the Risk of Market Expansion. These 20 variables are summarised in Table 7-3 below. A field is also added to show which search terms are used during the literature review to investigate each construct.

Table 7-3: First refinement of exhaustive list, to ten 'opportunity' and ten 'risk' variables for further analysis, as well as search terms used during literature review

CODE	INDICATOR / VARIABLE	OPPORTUNITY VS RISK	SEARCH TERMS FOR LITERATURE STUDY
BRANDRECOG	Brand Recognition	MARKETING	BRAND RECOGNITION / MARKETING
GDP	GDP based on PPP valuation (USD Million)	OPPORTUNITY	GROSS DOMESTIC PRODUCT / GDP / MARKET SIZE
GPD/CAP	GDP per Capita (PPP valuation)	OPPORTUNITY	GDP PER CAPITA / GNI PER CAPITA / POPULATION WEALTH / PROSPERITY
AGEDISTRIBUTE	Distribution by age (%)	OPPORTUNITY	AGE DISTRIBUTION / DEMOGRAPHIC DIVIDENT / INACTIVITY RATE
POPDENSE	Population Density	OPPORTUNITY	POPULATION DENSITY
POPGROW	Population growth rate (per 1000)	OPPORTUNITY	POPULATION GROWTH
POPURBAN	Urban population	OPPORTUNITY	URBANIZATION / URBAN POPULATION SIZE
COMPETITIVE	Competitiveness Indicator (%)	OPPORTUNITY	COMPETITIVENESS / DIVERSIFICATION / EXPORT GROWTH
FDIINFLOW	FDI Inflows per historical year	OPPORTUNITY	FOREIGN DIRECT INVESTMENT / FDI INFLOW
GDPGROW	Annual real GDP growth	OPPORTUNITY	GDP GROWTH / ECONOMIC GROWTH
LIFEEXPECT	Life expectancy at birth (years)	RISK	LIFE EXPECTANCY / NOURISHMENT / UNDERNOURISHED
LITERACYADULT	Estimated adult literacy rate, 2010-15 (people over	RISK	ADULT LITERACY / EDUCATION / SCHOOLING
WATERURB	Water supply coverage (%) (Urban)	RISK	ACCESS TO WATER / SANITATION COVERAGE / ACCESS TO BASIC SERVICE
NEWLABOUR15	Yearly cohort of new labour entrants	RISK	NEW LABOUR ENTRANTS / PARTICIPATION RATE / UNEMPLOYMENT RATE
LOGPERFINDEX	Logistics Performance Index	RISK	LOGISTICS / INFRASTRUCTURE / GEOGRAPHIC DISTANCE
EASEBUSINESS	Ease of doing Business ranking	RISK	EASE OF DOING BUSINESS / PSYCHIC DISTANCE
ECONOFREEDOM	Economic Freedom	RISK	ECONOMIC FREEDOM / DEMOCRACY
GOVERNANCE	Governance	RISK	GOVERNANCE
CORRUPT	Corruption Perceptions Index 2013-15	RISK	CORRUPTION
TRADEBORDER	Ease of Trading Across Borders	RISK	EASE OF TRADE / CROSS BORDER TRADE

Table 7-4: Final refinement of variable list, to 7 'opportunity' and 7 'risk' variables for further analysis; references of data sources

Code	Type	Variable and Source
GDP	Opportunity	GDP based on PPP valuation (African Economic Outlook)
GDP/CAP	Opportunity	GDP *per capita* (PPP valuation) (African Economic Outlook)
POPGROW	Opportunity	Population growth rate (per 1000) (African Economic Outlook)
POPURBAN	Opportunity	Urban population (African Economic Outlook)
COMPETITIVE	Opportunity	Global Competitiveness ranking (World Economic Forum)
FDIINFLOW	Opportunity	FDI inflows per historical year (African Economic Outlook)
GDPGROW	Opportunity	Annual real GDP growth (average over 8 years) (African Economic Outlook)
LITERACYADULT	Risk	Estimated adult literacy rate (people over 15) (African Economic Outlook)
LOGPERFINDEX	Risk	Logistics Performance Index (The World Bank)
EASEBUSINESS	Risk	Ease of Doing Business ranking (The World Bank)
ECONOFREEDOM	Risk	Economic Freedom ranking (The Heritage Foundation)
GOVERNANCE	Risk	Ibrahim Index of African Governance ranking (Mo Ibrahim Foundation)
CORRUPT	Risk	Corruption Perceptions ranking (Transparency International)
TRADEBORDER	Risk	Ease of Trading Across Borders (The World Bank)

APPENDIX B: LITERATURE REVIEW MEDIA SELECTION

Appendix B contains data pertaining to the literature covered during the intensive literature review, and the content and statistical analyses. An exhaustive list of 85 media sources is reviewed during the course of analysing macro-economic variables for selection as part of Section 2 of the literature review. Each media type is assigned a perceived weight of importance, as explained in Chapter 3: Research Design, and summarised in Table 7-5 below.

Table 7-5: Summary of sample size selection of media sources and relative weights assigned

SOURCE OF MEDIA	**Weight (scale 1 to 5)**	**Max allowable age**	***Count of total samples***	***Count of samples used***	MEDIA CODE
Peer Reviewed Article <= 10 yrs	5	10	*23*	*18*	ART1
Peer Reviewed Article 10 to 15 yrs	4	15	*14*	*12*	ART2
Peer Reviewed Article > 15 yrs	3	15	*1*	*1*	ART3
Textbook <= 15 yrs	5	15	*11*	*6*	TXT1
Textbook > 15 yrs	4	50	*1*	*1*	TXT2
Developed Index	2	2	*8*		IND1
White Paper Big 4	3	5	*18*	*7*	WHT1
White Paper other	2	5	*9*		WHT2
TOTAL			***85***	***45***	

The list of 85 units is refined and reduced to a sample size of 45 media sources through an iterative process (explained in Chapter 4: Data collection) that are considered to be reliable, as listed in Table 7-6 below.

Table 7-6: Final media selection, sources and assigned weights

SAMPLE NAME	**SOURCE**	**TYPE OF MEDIA**	**MEDIA CODE**	**Date published**	**# times cited**	**avg # times cited pa**	**TEST < max allow age**	**Weight**
A retrospective on: Institutional, cultural and transaction cost influences on entry mode choice and performance	Brouthers (2013)	Peer Reviewed Article <= 10 yrs	18	2013	111	28	Y	5
Africa by Numbers: Assessing risk and opportunity in Africa	Ernst & Young (2013)	White Paper Big 4	7	2013		-	Y	3
An examination of international retail franchising in emerging markets	Welsh et al. (2006)	Peer Reviewed Article <= 10 yrs	18	2006	172	16	Y	5
Beyond entry mode--SME escalation in emerging markets: a conceptual framework	Akbar et al. (2014)	Peer Reviewed Article <= 10 yrs	18	2014	8	3	Y	5
Commodity chains and global capitalism	Gereffi & Korzeniewicz (1994)	Textbook > 15 yrs	1	1994	2973	129	Y	4
Comparing capitalisms: Understanding institutional diversity and its implications for international business	Jackson & Deeg (2008)	Peer Reviewed Article <= 10 yrs	18	2008	418	46	Y	5
Consumer profiles of apparel product involvement and values	Kim (2005)	Peer Reviewed Article 10 to 15 yrs	12	2005	176	15	Y	4
Designing and managing the supply chain: Concepts, strategies, and case studies	Levi et al. (2003)	Textbook <= 15 yrs	6	2003	177	13	Y	5
Distance still matters	Ghemawat (2001)	Peer Reviewed Article 10 to 15 yrs	12	2001	1805	113	Y	4
Does Foreign Direct Investment Reduce Poverty in Africa	Gohou & Soumaré (2012)	Peer Reviewed Article <= 10 yrs	18	2012	88	18	Y	5

SAMPLE NAME	SOURCE	TYPE OF MEDIA	MEDIA CODE	Date published	# times cited	avg # times cited pa	TEST < max allow age	Weight
Economics of development	Gillis et al. (2006)	Textbook <= 15 yrs	6	2006	1520	138	Y	5
Effective distributor governance in emerging markets: the salience of distributor role, relationship stages, and market uncertainty	Dong et al. (2010)	Peer Reviewed Article <= 10 yrs	18	2010	40	6	Y	5
Emerging market entry node pattern and experiential knowledge of small and medium-sized enterprises	Kuivalainen et al. (2013)	Peer Reviewed Article <= 10 yrs	18	2013	35	9	Y	5
Ernst & Young's attractiveness survey: Africa 2015	Ernst & Young (2015a)	White Paper Big 4	7	2015		-	Y	3
Exporters moving toward emerging markets: a resource-based approach	Bortoluzzi et al. (2014)	Peer Reviewed Article <= 10 yrs	18	2014	18	6	Y	5
Foreign aid, foreign direct investment and economic growth in Sub-Saharan Africa: Evidence from pooled mean group estimator (PMG)	Njoupouognigni & others (2010)	Peer Reviewed Article <= 10 yrs	18	2010	54	8	Y	5
Foreign direct investment in Africa: Performance, challenges, and responsibilities	Dupasquier & Osakwe (2006)	Peer Reviewed Article 10 to 15 yrs	12	2006	257	23	Y	4
Foreign direct investment in Southern Africa: determinants, characteristics and implications for economic growth and poverty alleviation	Jenkins & Thomas (2002)	Textbook <= 15 yrs	6	2002	162	11	Y	5
Global production networks and the analysis of economic development	Henderson et al. (2002)	Peer Reviewed Article 10 to 15 yrs	12	2002	1698	113	Y	4
Global production networks, knowledge diffusion, and local capability formation	Ernst & Kim (2002)	Peer Reviewed Article 10 to 15 yrs	12	2002	1199	80	Y	4
Global value chains and international competition	Gereffi (2011)	Peer Reviewed Article <= 10 yrs	18	2011	50	8	Y	5
Governance indicators: Where are we, where should we be going?	Kaufmann & Kraay (2008)	Peer Reviewed Article <= 10 yrs	18	2008	391	43	Y	5
How we compete: What companies around the world are doing to make it in today's global economy	Berger (2005)	Textbook <= 15 yrs	6	2005	470	39	Y	5
Internationalization in retailing: Modeling the pattern of foreign market entry	Gripsrud & Benito (2005)	Peer Reviewed Article 10 to 15 yrs	12	2005	78	7	Y	4
Learning and earning in global garment and footwear chains	Schmitz (2006)	Peer Reviewed Article 10 to 15 yrs	12	2006	165	15	Y	4
Local clusters in global chains: the causes and consequences of export dynamism in Torreon's blue jeans industry	Bair & Gereffi (2001)	Peer Reviewed Article 10 to 15 yrs	12	2001	776	49	Y	4
Managing Risk in an Unstable World	Bremmer (2005)	Peer Reviewed Article	12	2005	100	8	Y	4
Managing supply chains: A logistics approach	Coyle et al. (2013)	Textbook <= 15 yrs	6	2008	131	15	Y	5
Market penetration and acquisition strategies for emerging economies	Meyer & Tran (2006)	Peer Reviewed Article <= 10 yrs	18	2006	147	13	Y	5
Megatrends 2015 - Making sense of a world in motion	Ernst & Young (2015b)	White Paper Big 4	7	2015		-	Y	3
Multinational enterprises' entry mode strategies and uncertainty: a review and extension	Ahsan & Musteen (2011)	Peer Reviewed Article <= 10 yrs	18	2011	59	10	Y	5
Practices and performance of small retail stores in developing economies	Lenartowicz & Balasubramanian (2009)	Peer Reviewed Article <= 10 yrs	18	2009	46	6	Y	5
Prisoners of Geography: ten maps that tell you everything you need to know about global politics	Marshall (2015)	Textbook <= 15 yrs	6	2015	9	5	Y	5
Promoting of Investment in Africa	Anyanwu (2006)	Peer Reviewed Article <= 10 yrs	18	2006	78	7	Y	5
R&C worlds Express: Opening the door to Africa	PwC (2013)	White Paper Big 4	7	2013		-	Y	3
Redefining business success in a changing world: Global survey of investor and CEO views	PriceWaterhouseCoopers (2016)	White Paper Big 4	7	2016		-	Y	3
Retailers' expansion mode choice in foreign markets: Antecedents for expansion mode choice in the light of internationalization theories	Picot-Coupey et al. (2014)	Peer Reviewed Article <= 10 yrs	18	2014	13	4	Y	5
Sector Report: The African Consumer and Retail	KPMG (2015)	White Paper Big 4	7	2015		-	Y	3
Strategies that fit emerging markets	Khanna et al. (2005)	Peer Reviewed Article 10 to 15 yrs	12	2005	782	65	Y	4
The Africa business agenda: Changing gear	PwC (2017)	White Paper Big 4	7	2017		######	Y	3
The eclectic paradigm as an envelope for economic and business theories of MNE activity	Dunning (2000)	Peer Reviewed Article > 15 yrs	1	2000	1936	114	N	3
The Economic Performance of Regions	Porter (2003)	Peer Reviewed Article 10 to 15 yrs	12	2003	2155	154	Y	4
The global apparel value chain, trade and the crisis: challenges and opportunities for developing countries	Gereffi & Frederick (2010)	Peer Reviewed Article <= 10 yrs	18	2010	293	42	Y	5
Trading on Time	Djankov et al. (2010)	Peer Reviewed Article <= 10 yrs	18	2010	397	57	Y	5
Whose culture matters? Near-market knowledge and its impact on foreign market entry timing	Mitra & Golder (2002)	Peer Reviewed Article 10 to 15 yrs	12	2002	283	19	Y	4

APPENDIX C: SECONDARY DATA COLLECTED

For each of the 14 final variables selected as representations of Market Opportunity and Risk of Market Entry, secondary data points are collected in their original format and unit of measure, as displayed in Table 7-7. Data collected is based the years 2016/2017, as close to the date of publication as possible.

Table 7-7: Secondary data points collected

			GDP	GDPGROW	POPGROW	FDIINFLOW	COMPETITIVE	GDP/CAP	POPURBAN	LITERACYADULT	CORRUPT	ECONOFREEDOM	GOVERNANCE	LOGPERFINDEX	TRADEBORDER	EASEBUSINESS
CODE	COUNTRY	SUB-SAHARAN	2016 GDP based on PPP valuation (USD Million)	Annual real GDP growth (average over 2007-2015)	2016 Population Growth (%)	FDI Inflow 2015 (USD million)	Global competitiveness effect 2011-15(%)	2016 GDP per Capita (PPP valuation, USD)	2016 total Urban Population (thousands)	Estimated adult literacy rate, 2010-15 (%) (age >15)	2016 Corruption Perception Index (CPI) (0 to 10, 10 = clean)	2017 Economic Freedom score (0 to 100)	2015 Mo Ibrahim Index of African Governance (0 to 100)	2015 Logistics performance index 1-5 (worst to best)	2016 distance to frontier: Trade across Border (0-100, high = best)	2016 Ease of Doing Business Ranking (1-190, high = best)
AGO	Angola	Y	187 257	4.30	3.23	8 681	1.42	7 249	10 542	71.16	1.80	48.52	39.20	2.24	43	182
BEN	Benin	Y	24 312	4.73	2.64	229	- 0.80	2 177	4 957	38.45	3.60	59.24	57.50	2.43	21	155
BFA	Burkina Faso	Y	32 985	6.39	2.92	167	41.60	1 770	5 653	37.75	4.20	59.61	51.80	2.73	8	146
BDI	Burundi	Y	7 892	2.98	3.34	7	34.46	683	1 378	85.50	2.00	53.19	41.90	2.51	30	157
CPV	Cabo Verde	Y	3 583	2.45	1.25	95	4.22	6 799	339	88.47	5.90	56.95	73.00	..	13	129
CMR	Cameroon	Y	77 237	4.31	2.49	620	6.49	3 228	13 173	74.99	2.60	51.81	45.70	2.15	46	166
CAF	Central African Republic	Y	3 206	- 0.05	2.00	3	- 8.23	641	1 975	36.75	2.00	51.81	25.70	2.36	24	185
TCD	Chad	Y	30 587	4.08	3.27	600	2.95	2 110	3 169	40.02	2.00	49.04	34.80	2.16	36	180
COM	Comoros	Y	1 259	2.31	2.36	5	7.04	1 560	224	78.14	2.40	55.84	50.30	2.58	11	153
COG	Congo	Y	30 272	3.84	2.61	1 486	1.46	6 385	3 149	79.31	2.00	40.03	43.00	2.38	42	177
COD	Democratic Republic of the	Y	66 014	6.06	3.18	1 674	3.42	828	31 475	77.22	2.10	56.41	35.80	2.38	47	184
DJI	Djibouti	Y	3 345	5.55	1.32	124	5.47	3 718	707	...	3.00	46.69	46.50	2.32	...	...
GNQ	Equatorial Guinea	Y	31 769	- 0.43	2.90	316	- 0.55	36 533	329	95.20	...	45.00	35.40	1.88	38	178
ERI	Eritrea	Y	9 169	3.24	2.37	49	2.58	1 713	1 602	73.85	1.80	42.23	30.00	2.17	37	189
ETH	Ethiopia	Y	174 742	9.73	2.48	2 168	13.84	1 716	20 203	49.03	3.40	52.66	49.10	2.38	34	159
GAB	Gabon	Y	36 218	4.54	2.19	624	- 1.94	20 542	1 565	83.24	3.50	58.60	48.80	2.19	33	164
GMB	Gambia	Y	3 387	3.58	3.22	11	- 6.75	1 648	1 224	55.57	2.60	53.40	46.60	2.25	12	145
GHA	Ghana	Y	120 786	6.61	2.27	3 192	12.00	4 309	15 055	76.58	4.30	56.22	63.90	2.66	29	108
GIN	Guinea	Y	16 084	2.99	2.68	85	- 0.27	1 242	4 765	30.47	2.70	47.58	43.30	2.36	32	163
GNB	Guinea-Bissau	Y	2 851	3.87	2.39	18	- 11.40	1 510	917	59.77	1.60	56.12	41.30	2.37	28	172
CIV	Ivory Coast	Y	87 120	5.88	2.43	430	5.20	3 746	11 953	43.27	3.40	62.99	52.30	2.60	27	142
KEN	Kenya	Y	152 735	5.26	2.61	1 437	3.24	3 232	12 496	78.02	2.60	53.48	58.90	3.33	9	92
LBR	Liberia	Y	3 881	4.67	2.48	512	12.17	841	2 312	47.60	3.70	49.12	50.00	2.20	45	174
MDG	Madagascar	Y	37 491	2.72	2.81	517	12.17	1 505	8 905	64.66	2.60	57.39	48.50	2.15	18	167
MWI	Malawi	Y	21 227	5.18	3.11	143	2.92	1 196	2 929	65.96	3.10	52.19	56.60	2.81	15	133
MLI	Mali	Y	38 085	4.41	3.04	153	147.35	2 100	6 824	33.07	3.20	58.63	50.60	2.50	7	141
MRT	Mauritania	Y	16 710	3.63	2.43	495	- 0.87	4 010	2 525	52.12	2.70	54.41	43.50	1.87	23	160
MUS	Mauritius	Y	25 849	3.72	0.33	208	6.47	20 235	497	90.62	5.40	74.71	79.90	2.51	4	49
MOZ	Mozambique	Y	35 313	6.61	2.76	3 711	6.52	1 228	9 031	58.84	2.70	49.95	52.30	2.68	10	137
NER	Niger	Y	20 266	5.88	4.10	525	12.61	978	3 808	19.10	3.50	50.81	50.20	2.56	20	150
NGA	Nigeria	Y	1 088 938	4.79	2.63	3 064	- 1.02	5 824	91 669	59.57	2.80	57.06	46.50	2.63	41	169
RWA	Rwanda	Y	21 970	7.18	2.35	471	5.29	1 849	3 799	71.24	5.40	67.55	62.30	2.99	6	56
STP	Sao Tome and Principe	Y	694	5.05	2.13	28	- 1.77	3 573	136	91.75	4.60	55.38	60.50	2.33	16	162
SEN	Senegal	Y	39 717	4.66	3.04	345	2.76	2 548	6 782	55.62	4.50	55.93	60.80	2.33	19	147
SYC	Seychelles	Y	2 608	4.11	0.58	195	7.59	26 877	51	95.32	...	61.79	72.60	..	5	93
SLE	Sierra Leone	Y	10 636	4.98	2.15	519	10.73	1 613	2 593	48.43	3.00	52.57	49.40	2.03	35	148
ZAF	South Africa	Y	736 325	1.68	0.90	1 772	- 3.38	13 393	35 152	94.60	4.50	62.28	69.40	3.78	25	74
SSD	South Sudan	Y	20 884	- 6.03	3.19	- 277	...	1 640	2 385	31.98	1.10	...	18.60	..	39	186
TZA	Tanzania	Y	150 633	6.62	3.15	1 532	16.27	2 731	17 402	80.36	3.20	58.58	56.50	2.99	40	132
TGO	Togo	Y	11 609	4.55	2.63	53	4.23	1 548	2 974	66.54	3.20	53.24	48.50	2.62	14	154
UGA	Uganda	Y	84 925	5.95	3.31	1 057	5.73	2 106	6 819	73.81	2.50	60.91	56.20	3.04	22	115
ZMB	Zambia	Y	65 174	5.89	3.12	1 653	- 0.13	3 899	6 635	85.12	3.80	55.80	58.80	2.43	31	98
ZWE	Zimbabwe	Y	28 326	3.06	2.33	421	7.20	1 774	4 998	86.87	2.20	44.05	44.30	2.08	26	161

Examples of scaling data:

Table 7-8: Example of scaling data for the variable = GDP using a log formula, to a standardised z value

	GDP				
	mean	4.38		new min (a)	-
	stdev	0.69		new max (b)	1.00
	sample size	43.00		old min (A)	-2.25
	standard error	0.205	90% conf interv	old max (B)	2.41

Convert to RawValue y = log(x)

Then ScaledValue = (y - min(y)) / (max(y) - min(y))

CODE	COUNTRY	2016 GDP based on PPP valuation (USD Million)	Raw Value: LOG	Standardized z scale (-1 to 1)	Final scaled value: (0 to 1)
STP	Sao Tome and Principe	694	2.84	-2.25	-
COM	Comoros	1 259	3.10	-1.87	0.08
SYC	Seychelles	2 608	3.42	-1.41	0.18
GNB	Guinea-Bissau	2 851	3.45	-1.35	0.19
CAF	Central African Republic	3 206	3.51	-1.28	0.21
DJI	Djibouti	3 345	3.52	-1.25	0.21
GMB	Gambia	3 387	3.53	-1.25	0.22
CPV	Cabo Verde	3 583	3.55	-1.21	0.22
LBR	Liberia	3 881	3.59	-1.16	0.23
BDI	Burundi	7 892	3.90	-0.71	0.33
ERI	Eritrea	9 169	3.96	-0.62	0.35
SLE	Sierra Leone	10 636	4.03	-0.52	0.37
TGO	Togo	11 609	4.06	-0.47	0.38
GIN	Guinea	16 084	4.21	-0.26	0.43
MRT	Mauritania	16 710	4.22	-0.24	0.43
NER	Niger	20 266	4.31	-0.11	0.46
SSD	South Sudan	20 884	4.32	-0.09	0.46
MWI	Malawi	21 227	4.33	-0.08	0.46
RWA	Rwanda	21 970	4.34	-0.06	0.47
BEN	Benin	24 312	4.39	0.00	0.48
MUS	Mauritius	25 849	4.41	0.04	0.49
ZWE	Zimbabwe	28 326	4.45	0.10	0.50
COG	Congo	30 272	4.48	0.14	0.51
TCD	Chad	30 587	4.49	0.15	0.51
GNQ	Equatorial Guinea	31 769	4.50	0.17	0.52
BFA	Burkina Faso	32 985	4.52	0.19	0.52
MOZ	Mozambique	35 313	4.55	0.24	0.53
GAB	Gabon	36 218	4.56	0.25	0.54
MDG	Madagascar	37 491	4.57	0.28	0.54
MLI	Mali	38 085	4.58	0.29	0.54
SEN	Senegal	39 717	4.60	0.31	0.55
ZMB	Zambia	65 174	4.81	0.63	0.62
COD	Democratic Republic of the Congo	66 014	4.82	0.63	0.62
CMR	Cameroon	77 237	4.89	0.73	0.64
UGA	Uganda	84 925	4.93	0.79	0.65
CIV	Ivory Coast	87 120	4.94	0.81	0.66
GHA	Ghana	120 786	5.08	1.02	0.70
TZA	Tanzania	150 633	5.18	1.16	0.73
KEN	Kenya	152 735	5.18	1.16	0.73
ETH	Ethiopia	174 742	5.24	1.25	0.75
AGO	Angola	187 257	5.27	1.29	0.76
ZAF	South Africa	736 325	5.87	2.16	0.95
NGA	Nigeria	1 088 938	6.04	2.41	1.00

Table 7-9: Example of scaling data of the variable = GDPGROW to a standardised z value

CODE	COUNTRY	Annual real GDP growth (average over 2007-2015) %	Standardized z scale (-1 to 1)	Final scaled value: (0 to 1)
SSD	South Sudan	- 6.03	-4.21	-
GNQ	Equatorial Guinea	- 0.43	-1.91	0.36
CAF	Central African Republic	- 0.05	-1.75	0.38
ZAF	South Africa	1.68	-1.04	0.49
COM	Comoros	2.31	-0.79	0.53
CPV	Cabo Verde	2.45	-0.73	0.54
MDG	Madagascar	2.72	-0.62	0.56
BDI	Burundi	2.98	-0.51	0.57
GIN	Guinea	2.99	-0.51	0.57
ZWE	Zimbabwe	3.06	-0.48	0.58
ERI	Eritrea	3.24	-0.40	0.59
GMB	Gambia	3.58	-0.27	0.61
MRT	Mauritania	3.63	-0.24	0.61
MUS	Mauritius	3.72	-0.21	0.62
COG	Congo	3.84	-0.16	0.63
GNB	Guinea-Bissau	3.87	-0.15	0.63
TCD	Chad	4.08	-0.06	0.64
SYC	Seychelles	4.11	-0.04	0.64
AGO	Angola	4.30	0.03	0.66
CMR	Cameroon	4.31	0.04	0.66
MLI	Mali	4.41	0.08	0.66
GAB	Gabon	4.54	0.13	0.67
TGO	Togo	4.55	0.13	0.67
SEN	Senegal	4.66	0.18	0.68
LBR	Liberia	4.67	0.19	0.68
BEN	Benin	4.73	0.21	0.68
NGA	Nigeria	4.79	0.23	0.69
SLE	Sierra Leone	4.98	0.31	0.70
STP	Sao Tome and Principe	5.05	0.34	0.70
MWI	Malawi	5.18	0.39	0.71
KEN	Kenya	5.26	0.43	0.72
DJI	Djibouti	5.55	0.54	0.73
CIV	Ivory Coast	5.88	0.68	0.76
NER	Niger	5.88	0.68	0.76
ZMB	Zambia	5.89	0.69	0.76
UGA	Uganda	5.95	0.71	0.76
COD	Democratic Republic of the Congo	6.06	0.76	0.77
BFA	Burkina Faso	6.39	0.89	0.79
MOZ	Mozambique	6.61	0.98	0.80
GHA	Ghana	6.61	0.98	0.80
TZA	Tanzania	6.62	0.98	0.80
RWA	Rwanda	7.18	1.21	0.84
ETH	Ethiopia	9.73	2.26	1.00

Table 7-10: Final outputs of scaled data

COUNTRY CODE	GDP	GDPGROW	POPGROW	FDIINFLOW	COMPETITIVE	GPD/CAP	POPURBAN	LITERACYADULT	CORRUPT	ECONOFREEDOM	GOVERNANCE	LOGPERFINDEX	TRADEBORDER	EASEBUSINESS
AGO	0.76	0.66	0.77	1.00	0.08	0.18	0.11	0.32	0.85	0.76	0.66	0.81	0.09	0.05
BEN	0.48	0.68	0.61	0.03	0.07	0.04	0.05	0.75	0.48	0.45	0.37	0.71	0.60	0.24
BFA	0.52	0.79	0.69	0.02	0.33	0.03	0.06	0.76	0.35	0.44	0.46	0.55	0.91	0.31
BDI	0.33	0.57	0.80	0.00	0.29	0.00	0.01	0.13	0.81	0.62	0.62	0.66	0.40	0.23
CPV	0.22	0.54	0.24	0.01	0.10	0.17	0.00	0.09	-	0.51	0.11	0.72	0.79	0.43
CMR	0.64	0.66	0.57	0.07	0.11	0.07	0.14	0.27	0.69	0.66	0.56	0.85	0.02	0.16
CAF	0.21	0.38	0.44	0.00	0.02	-	0.02	0.77	0.81	0.66	0.88	0.74	0.53	0.03
TCD	0.51	0.64	0.78	0.07	0.09	0.04	0.03	0.73	0.81	0.74	0.74	0.85	0.26	0.06
COM	0.08	0.53	0.54	0.00	0.12	0.03	0.00	0.23	0.73	0.54	0.48	0.63	0.84	0.26
COG	0.51	0.63	0.60	0.17	0.08	0.16	0.03	0.21	0.81	1.00	0.60	0.73	0.12	0.09
COD	0.62	0.77	0.75	0.19	0.09	0.01	0.34	0.24	0.79	0.53	0.72	0.73	-	0.04
DJI	0.21	0.73	0.26	0.01	0.11	0.09	0.01	0.29	0.60	0.81	0.54	0.76	0.60	0.42
GNQ	0.52	0.36	0.68	0.04	0.07	1.00	0.00	0.00	0.69	0.86	0.73	0.99	0.21	0.08
ERI	0.35	0.59	0.54	0.01	0.09	0.03	0.02	0.28	0.85	0.94	0.81	0.84	0.23	-
ETH	0.75	1.00	0.57	0.25	0.16	0.03	0.22	0.61	0.52	0.64	0.50	0.73	0.30	0.21
GAB	0.54	0.67	0.49	0.07	0.06	0.55	0.02	0.16	0.50	0.46	0.51	0.83	0.33	0.18
GMB	0.22	0.61	0.77	0.00	0.03	0.03	0.01	0.52	0.69	0.61	0.54	0.80	0.81	0.31
GHA	0.70	0.80	0.52	0.37	0.15	0.10	0.16	0.25	0.33	0.53	0.26	0.59	0.42	0.58
GIN	0.43	0.57	0.62	0.01	0.07	0.02	0.05	0.85	0.67	0.78	0.60	0.74	0.35	0.19
GNB	0.19	0.63	0.55	0.00	-	0.02	0.01	0.47	0.90	0.54	0.63	0.74	0.44	0.12
CIV	0.66	0.76	0.56	0.05	0.10	0.09	0.13	0.68	0.52	0.34	0.45	0.62	0.47	0.34
KEN	0.73	0.72	0.60	0.17	0.09	0.07	0.14	0.23	0.69	0.61	0.34	0.24	0.88	0.69
LBR	0.23	0.68	0.57	0.06	0.15	0.01	0.02	0.63	0.46	0.74	0.49	0.83	0.05	0.11
MDG	0.54	0.56	0.66	0.06	0.15	0.02	0.10	0.40	0.69	0.50	0.51	0.85	0.67	0.16
MWI	0.46	0.71	0.74	0.02	0.09	0.02	0.03	0.39	0.58	0.65	0.38	0.51	0.74	0.40
MLI	0.54	0.66	0.72	0.02	1.00	0.04	0.07	0.82	0.56	0.46	0.48	0.67	0.93	0.34
MRT	0.43	0.61	0.56	0.06	0.07	0.09	0.03	0.57	0.67	0.59	0.59	1.00	0.56	0.21
MUS	0.49	0.62	-	0.02	0.11	0.55	0.00	0.06	0.10	-	-	0.66	1.00	1.00
MOZ	0.53	0.80	0.65	0.43	0.11	0.02	0.10	0.48	0.67	0.71	0.45	0.58	0.86	0.37
NER	0.46	0.76	1.00	0.06	0.15	0.01	0.04	1.00	0.50	0.69	0.48	0.64	0.63	0.28
NGA	1.00	0.69	0.61	0.35	0.07	0.14	1.00	0.47	0.65	0.51	0.54	0.60	0.14	0.14
RWA	0.47	0.84	0.54	0.05	0.11	0.03	0.04	0.32	0.10	0.21	0.29	0.41	0.95	0.95
STP	-	0.70	0.48	0.00	0.06	0.08	0.00	0.05	0.27	0.56	0.32	0.76	0.72	0.19
SEN	0.55	0.68	0.72	0.04	0.09	0.05	0.07	0.52	0.29	0.54	0.31	0.76	0.65	0.30
SYC	0.18	0.64	0.06	0.02	0.12	0.73	-	-	0.61	0.37	0.12	0.62	0.98	0.69
SLE	0.37	0.70	0.48	0.06	0.14	0.03	0.03	0.62	0.60	0.64	0.50	0.92	0.28	0.29
ZAF	0.95	0.49	0.15	0.20	0.05	0.36	0.38	0.01	0.29	0.36	0.17	-	0.51	0.82
SSD	0.46	-	0.76	-	0.13	0.03	0.03	0.83	1.00	0.56	1.00	0.62	0.19	0.02
TZA	0.73	0.80	0.75	0.18	0.17	0.06	0.19	0.20	0.56	0.46	0.38	0.41	0.16	0.41
TGO	0.38	0.67	0.61	0.01	0.10	0.03	0.03	0.38	0.56	0.62	0.51	0.61	0.77	0.25
UGA	0.65	0.76	0.79	0.12	0.11	0.04	0.07	0.28	0.71	0.40	0.39	0.39	0.58	0.53
ZMB	0.62	0.76	0.74	0.19	0.07	0.09	0.07	0.13	0.44	0.55	0.34	0.71	0.37	0.65
ZWE	0.50	0.58	0.53	0.05	0.12	0.03	0.05	0.11	0.77	0.88	0.58	0.89	0.49	0.20

APPENDIX D: CASE STUDY: PRIMARY DATA COLLECTION

Principal Investigator: Lizet Engelbrecht
Project Number: SU-HSD-002739
As part of research in completion of MEng (Industrial) at the University of Stellenbosch

INTRODUCTORY AND ADMINISTRATIVE QUESTIONS

The following questions serve as introduction to data collection.
QUESTIONNAIRE INSTRUCTIONS: Populate grey cells only (blue content is open for editing if required).

1. COMPLETE: CONFIDENTIAL INFORMATION
For administrative purposes only and **will not be disclosed in any way** in the research results.

Name and surname of participant:	
Name of company currently employed at:	
Current position held at company:	
Relevance of subject matter expertise to the research conducted:	**Industry expert with extensive experience in retail industry and expansion of business into multiple African countries.**

2. COMPLETE: CONSENT TO PARTICIPATE
Has the following documentation been extended, **completed and signed** by all required parties?

Institutional Permission Letter	**Yes**
Individual Consent Form to participate in research	**Yes**
Any special requested documentation (like a Non-Disclosure Agreement)	**No, NDA not required**

Do you **understand and agree** with the following?

• You have the right to withdraw participation at any time. • You have the right to refuse to answer questions. • You have the right to withhold any data or information you do not feel comfortable sharing. • If unexpected, unsolicited data is revealed during the process of research, this data be kept confidential and only revealed if required by law.	

PLEASE DO NOT PROCEED WITH QUESTIONNAIRRE UNLESS ALL REQUIRED DOCUMENTATION IS COMPLETE.

Figure 7-1: Case Study Questionnaire: introductory sections

Principal Investigator: Lizet Engelbrecht
Project Number: SU-HSD-002739
As part of research in completion of MEng (Industrial) at the University of Stellenbosch

SCF RISK TOLERANCE MEASURE

The following question is based on the single risk-tolerance measure as developed by the Survey of Consumer Finances (SCF)

Answer the following question based on your personal context, experience and personality.

1. SELECT OPTION FROM DROP-DOWN LIST
Which of the following statements comes closest to the amount of financial risk that you are willing to take when you save or make investments?

a. Take substantial financial risk expecting to earn substantial returns
b. Take above average financial risk expecting to earn above average returns
c. Take average financial risk expecting to earn aver age returns
d. Not willing to take any financial risk

ANSWER:

Figure 7-2: Case Study Questionnaire: risk tolerance measurement

Principal Investigator: Lizet Engelbrecht
Project Number: SU-HSD-002739
As part of research in completion of MEng (Industrial) at the University of Stellenbosch

GUESSTIMATE OF NEXT AFRICAN MARKET TO ENTER

The following questions are based on the hypothetical situation:
A South African fashion retail company has opened stores successfully in SA, Botswana, Lesotho, Namibia and Swaziland (but no other countries). The retailer's target market is low-income (base-of-the-pyramid) individuals.
Assume the retailer will not be changing its product range or price classification when entering new markets.

List of countries under consideration: Sub Saharan Africa (as defined by the United Nations geopolitical regions)

Eastern Africa	**Western Africa**	**Middle Africa**
Burundi	Benin	Angola
Comoros	Burkina Faso	Cameroon
Djibouti	Cabo Verde	Central African Republic
Eritrea	Gambia	Chad
Ethiopia	Ghana	Congo
Kenya	Guinea	Democratic Republic of the Congo
Madagascar	Guinea-Bissau	Equatorial Guinea
Malawi	Ivory Coast	Gabon
Mauritius	Liberia	Sao Tome and Principe
Mozambique	Mali	
Rwanda	Mauritania	
Seychelles	Niger	
South Sudan	Nigeria	
Tanzania	Senegal	
Uganda	Sierra Leone	
Zambia	Togo	
Zimbabwe		

1. SELECT OPTIONS FROM DROP-DOWN LIST
From your personal experience and subject matter expertise, (without doing formal research and calculations):
Which Sub-Saharan African countries would you MOST LIKELY consider for expanding a retail company into next?

Select 10 distinct countries, in sequence of consideration:

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Figure 7-3: Case Study Questionnaire: best guess of next market to expand into

Principal Investigator: Lizet Engelbrecht
Project Number: SU-HSD-002739
As part of research in completion of MEng (Industrial) at the University of Stellenbosch

OPPORTUNITY VARIABLES: ANALYTICAL HIERARCHY PROCESS

Answer the following question in light of the specific context given below:

A South African retailer (with footprint in BLNS countries only), is considering which African market to enter next.
Many macroeconomic variables may be considered as an indicator of **MARKET OPPORTUNITY**.
Based on investors' varied opinions, some variables would carry more importance during decision-making.

In order to answer the questions below, make yourself familiar with the following abbreviations and concepts explained in layman terms:

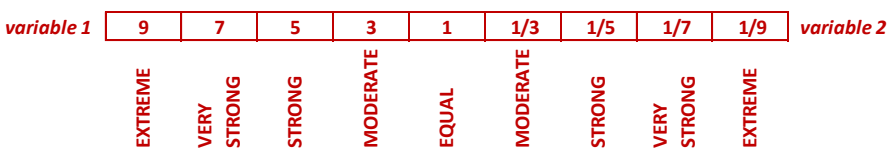
INDICATORS OF MARKET OPPORTUNITY:

GDP	**Gross Domestic Product**: The monetary value of all the finished goods and services produced within a country's borders in a specific time period. *Relevance: acts as a broad measure of the nation's overall economic activity.*
GDPGROW	**GDP Growth:** GDP tracked over a larger period of time, is used to indicate whether an economy is expanding or contracting. *Relevance: often used to measure a nations economic growth or decline.*
POPGROW	**Population Growth:** An increase in the number of people that reside in the country, measured from one year to the next. *Relevance: could be an indicator of future market size.*
FDIINFLOW	**Foreign Direct Investment:** an investment made by companies or individuals from a country in business interests in another country, either by establishing business operations or acquiring business assets. *Relevance: could be an indicator of the interest that competitors are showing in a country.*
COMPETITIVE	**Global Competitiveness Rating:** The World Economic Forum releases an annual index, rating countries based on a set of institutions, policies, and factors that give an indication of how productively a country uses its resources. *Relevance: acts as an indicator of a nation's economic prosperity.*
GPD/CAP	**Per capita GDP:** is a measure of the total output of a country that takes gross domestic product (GDP) and divides it by the number of people in the country. *Relevance: a good measure of a country's productivity and standard of living.*
POPURBAN	**Urban Population Size:** the number of people that reside in urban areas (settlement with high population density and infrastructure of built environment). *Relevance: acts as in indicator of market size in the retail sector.*
POPDENSE	**Population Density:** the average number of people per unit of area that reside in a country (this measure includes both urban and rural areas). *Relevance: acts as in indicator of market size within a specific radius.*
AGEDISTRIBUTE	**Distribution of Age**: the demographic indicator that shows the distribution of various age groups in a population for age categories 0 to 14, 15 to 64, 65 +. *Relevance: indicates the potential size of labour market as well as retail target market.*
BRANDRECOG	**Brand Recognition:** the extent to which a consumer can correctly identify a particular product or service just by viewing the product or service's logo or advertising campaign. *Relevance: gives an indication of the success of marketing campaigns.*

1. FOR EACH SLIDE SCALE, MARK WITH X

In YOUR PERSONAL OPINION from industry experience, rate the variables RELATIVE to one another on the slide scale (**MARK WITH X**). This indicates the perceived importance of one macroeconomic variable compared to the next, during the decision-making problem described.

SLIDE SCALE OF PERCEIVED IMPORTANCE OF TWO VARIABLES IN RELATION TO ONE ANOTHER:



Example: rating = 1 considers both variables to be equally important.

	9	7	5	3	1	1/3	1/5	1/7	1/9	
GDP										GDPGROW
GDP										POPGROW
GDP										FDIINFLOW
GDP										COMPETITIVE
GDP										GPD/CAP
GDP										POPURBAN
GDPGROW										POPGROW
GDPGROW										FDIINFLOW
GDPGROW										COMPETITIVE
GDPGROW										GPD/CAP
GDPGROW										POPURBAN
POPGROW										FDIINFLOW
POPGROW										COMPETITIVE
POPGROW										GPD/CAP
POPGROW										POPURBAN
FDIINFLOW										COMPETITIVE
FDIINFLOW										GPD/CAP
FDIINFLOW										POPURBAN
COMPETITIVE										GPD/CAP
COMPETITIVE										POPURBAN
GPD/CAP										POPURBAN

Figure 7-4: Case Study Questionnaire: slide scale input for AHP on Opportunity variables

Principal Investigator: Lizet Engelbrecht
Project Number: SU-HSD-002739
As part of research in completion of MEng (Industrial) at the University of Stellenbosch

RISK VARIABLES: ANALYTICAL HIERARCHY PROCESS

Answer the following question in light of the specific context given below:

A South African retailer (with footprint in BLNS countries only), is considering which African market to enter next.
Many macroeconomic variables may be considered as an indicator of the **RISK OF MARKET ENTRY**.
Based on investors' varied opinions, some variables would carry more importance during decision-making.

In order to answer the questions below, make yourself familiar with the following abbreviations and concepts explained in layman terms:

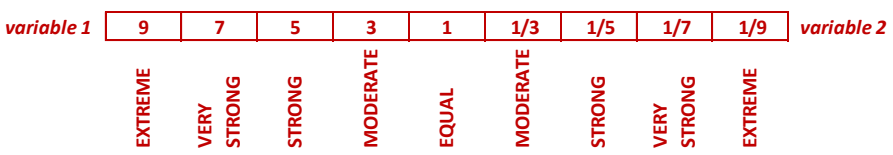
INDICATORS OF RISK OF MARKET ENRTY:

NEWLABOUR15	**New Labour Entrants FY2015:** Refers to a cohort of individuals who have never worked before, who are of employable age and entering the labour market for the first time. *Relevance: indicates growth of target market with disposable income, as well as size of available labour force.*
LITERACYADULT	**Estimated adult literacy rate:** the % of the population age 15 and above who can, with understanding, read and write short, simple statements. Generally, 'literacy' also encompasses 'numeracy'. *Relevance: an indicator of quality of education in a country, correlates to quality of available labour force.*
WATERURB	**Urban Water Supply Coverage:** The rate of coverage of water supply in urban areas of the country. Acts as an indicator of access to basic service delivery such as sanitation. *Relevance: indicator of quality of infrastructure (affecting cost of doing business) as well as general quality life.*
LIFEEXPECT	**Life Expectancy:** The average period that a person may expect to live. *Relevance: indicator of access to basic services such as health care, which has a direct correlation to the quality of health in a country, poverty levels, as well as the productivity of the available labour market.*
CORRUPT	**Corruption Perceptions Index:** Published by Transparency International (TI), ranks countries by perceived levels of corruption, determined by expert assessments and surveys. Indicates the level of misuse of public power. *Relevance: direct indication of risk and productivity; Corruption increases the cost of long-term investment.*
ECONOFREEDOM	**Index of Economic Freedom:** annual index and ranking created by The Heritage Foundation and The Wall Street Journal to measure the degree of economic freedom in the world's nations. *Relevance: indicates economic fluidity; econ stability is correlated to growth, and reduced risk of doing busines.*
MOIBRAHIM	**Mo Ibrahim Index of African Governance:** Annual assessment of the quality of governance in African countries (the provision of political, social and economic goods that a citizen has the right to expect from the state). *Relevance: correlates to economic growth; good governance improves environment for investment.*
LOGPERFINDEX	**Logistics performance index:** LPI is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics. *Relevance: indicator of local distribution risk; considers distribution lead times and operational costs.*
TRADEBORDER	**Trade across Border:** The distance to frontier score helps assess the absolute level of regulatory performance of cross-border trade over time. It measures the distance of each economy to the "frontier" (best performance). *Relevance: indicator of global distribution risk; considers distribution lead times and operational costs.*
EASEBUSINESS	**Ease of Doing Business Ranking:** index created by the World Bank Group. Higher rankings (a low numerical value) indicate better, usually simpler, regulations for businesses and stronger protections of property rights. *Relevance: indicates overall ease of doing business in a country; holistic index including wide range of variables.*

1. FOR EACH SLIDE SCALE, MARK WITH X

In YOUR PERSONAL OPINION from industry experience, rate the variables RELATIVE to one another on the slide scale (**MARK WITH X**). This indicates the perceived importance of one macroeconomic variable compared to the next, during the decision-making problem described.

SLIDE SCALE OF PERCEIVED IMPORTANCE OF TWO VARIABLES IN RELATION TO ONE ANOTHER:



Example: rating = 1 considers both variables to be equally important.

	9	7	5	3	1	1/3	1/5	1/7	1/9	
LITERACYADULT										CORRUPT
LITERACYADULT										ECONOFREEDO
LITERACYADULT										GOVERNANCE
LITERACYADULT										LOGPERFINDEX
LITERACYADULT										TRADEBORDER
LITERACYADULT										EASEBUSINESS
CORRUPT										ECONOFREEDO
CORRUPT										GOVERNANCE
CORRUPT										LOGPERFINDEX
CORRUPT										TRADEBORDER
CORRUPT										EASEBUSINESS
ECONOFREEDO										GOVERNANCE
ECONOFREEDO										LOGPERFINDEX
ECONOFREEDO										TRADEBORDER
ECONOFREEDO										EASEBUSINESS
GOVERNANCE										LOGPERFINDEX
GOVERNANCE										TRADEBORDER
GOVERNANCE										EASEBUSINESS
LOGPERFINDEX										TRADEBORDER
LOGPERFINDEX										EASEBUSINESS
TRADEBORDER										EASEBUSINESS

Figure 7-5: Case Study Questionnaire: slide scale input for AHP on Risk variables

APPENDIX E: CASE STUDY: ANALYTICAL HIERARCHY PROCESS

OPPORTUNITY

PARTICIPANT	VARIABLE	RGMM
1	GDP	40.947%
1	GDPGROW	17.950%
1	POPGROW	15.922%
1	FDIINFLOW	11.087%
1	COMPETITIVE	6.202%
1	GPD/CAP	4.420%
1	POPURBAN	3.473%
2	GDP	6.587%
2	GDPGROW	19.546%
2	POPGROW	4.159%
2	FDIINFLOW	13.275%
2	COMPETITIVE	6.057%
2	GPD/CAP	33.669%
2	POPURBAN	16.707%
3	GDP	5.480%
3	GDPGROW	18.153%
3	POPGROW	7.785%
3	FDIINFLOW	16.876%
3	COMPETITIVE	29.069%
3	GPD/CAP	19.047%
3	POPURBAN	3.591%
4	GDP	5.527%
4	GDPGROW	35.989%
4	POPGROW	12.572%
4	FDIINFLOW	19.912%
4	COMPETITIVE	7.299%
4	GPD/CAP	15.822%
4	POPURBAN	2.878%
5	GDP	17.440%
5	GDPGROW	12.565%
5	POPGROW	16.007%
5	FDIINFLOW	3.533%
5	COMPETITIVE	3.987%
5	GPD/CAP	40.597%
5	POPURBAN	5.871%
combined	GDP	12.953%
combined	GDPGROW	23.953%
combined	POPGROW	12.222%
combined	FDIINFLOW	13.440%
combined	COMPETITIVE	9.732%
combined	GPD/CAP	21.595%
combined	POPURBAN	6.106%

RISK

PARTICIPANT	VARIABLE	RGMM
1	LITERACYADULT	36.232%
1	CORRUPT	9.703%
1	ECONOFREEDOM	16.713%
1	GOVERNANCE	9.703%
1	LOGPERFINDEX	12.211%
1	TRADEBORDER	8.921%
1	EASEBUSINESS	6.518%
2	LITERACYADULT	15.970%
2	CORRUPT	11.667%
2	ECONOFREEDOM	15.970%
2	GOVERNANCE	11.667%
2	LOGPERFINDEX	8.524%
2	TRADEBORDER	12.689%
2	EASEBUSINESS	23.513%
3	LITERACYADULT	19.339%
3	CORRUPT	24.338%
3	ECONOFREEDOM	13.135%
3	GOVERNANCE	3.784%
3	LOGPERFINDEX	5.179%
3	TRADEBORDER	6.756%
3	EASEBUSINESS	27.470%
4	LITERACYADULT	3.787%
4	CORRUPT	10.840%
4	ECONOFREEDOM	15.960%
4	GOVERNANCE	18.673%
4	LOGPERFINDEX	20.308%
4	TRADEBORDER	10.840%
4	EASEBUSINESS	19.592%
5	LITERACYADULT	3.139%
5	CORRUPT	41.770%
5	ECONOFREEDOM	3.951%
5	GOVERNANCE	7.423%
5	LOGPERFINDEX	21.250%
5	TRADEBORDER	7.875%
5	EASEBUSINESS	14.592%
combined	LITERACYADULT	12.339%
combined	CORRUPT	19.168%
combined	ECONOFREEDOM	13.799%
combined	GOVERNANCE	10.651%
combined	LOGPERFINDEX	14.056%
combined	TRADEBORDER	10.736%
combined	EASEBUSINESS	19.252%

Figure 7-6: AHP outputs: Final assigned weights as resulted from individual input, for each variable (with the weights based on the Row Geometric Mean Method)

Questionnairre feedback: Individual's "best guess" for next country to enter, without research or calculations

#	COUNTRY NAME	COUNTRY CODE	RANK
1	Zambia	ZMB	1
1	Angola	AGO	2
1	Mozambique	MOZ	3
1	Nigeria	NGA	4
1	Kenya	KEN	5
1	Ethiopia	ETH	6
1	Mauritius	MUS	7
1	Ghana	GHA	8
1	Zimbabwe	ZWE	9
1	Uganda	UGA	10
2	Nigeria	NGA	1
2	Ghana	GHA	2
2	Kenya	KEN	3
2	Malawi	MWI	4
2	Senegal	SEN	5
2	Rwanda	RWA	6
2	Democratic Republic of the Congo	COD	7
2	Uganda	UGA	8
2	Tanzania	TZA	9
2	Angola	AGO	10
3	Zambia	ZMB	1
3	Mozambique	MOZ	2
3	Angola	AGO	3
3	Zimbabwe	ZWE	4
3	Nigeria	NGA	5
3	Tanzania	TZA	6
3	Kenya	KEN	7
3	Ghana	GHA	8
3	Rwanda	RWA	9
3	Democratic Republic of the Congo	COD	10
4	Nigeria	NGA	1
4	Angola	AGO	2
4	Democratic Republic of the Congo	COD	3
4	Congo	COG	4
4	Tanzania	TZA	5
4	Kenya	KEN	6
4	Madagascar	MDG	7
4	Uganda	UGA	8
4	Ghana	GHA	9
4	Rwanda	RWA	10

Individual AHP conducted across Opportunity variables

#	COUNTRY NAME	COUNTRY CODE	HIGH OPP RANK
1	Nigeria	NGA	1
1	Angola	AGO	2
1	Ethiopia	ETH	3
1	Tanzania	TZA	4
1	Ghana	GHA	5
1	Kenya	KEN	6
1	Uganda	UGA	7
1	Democratic Republic of the Congo	COD	8
1	Zambia	ZMB	9
1	Mali	MLI	10
2	Nigeria	NGA	1
2	Equatorial Guinea	GNQ	2
2	Angola	AGO	3
2	Seychelles	SYC	4
2	Gabon	GAB	5
2	Ethiopia	ETH	6
2	Mauritius	MUS	7
2	Ghana	GHA	8
2	Tanzania	TZA	9
2	Democratic Republic of the Congo	COD	10
3	Mali	MLI	1
3	Angola	AGO	2
3	Ethiopia	ETH	3
3	Nigeria	NGA	4
3	Equatorial Guinea	GNQ	5
3	Ghana	GHA	6
3	Tanzania	TZA	7
3	Mozambique	MOZ	8
3	Burkina Faso	BFA	9
3	Gabon	GAB	10
4	Angola	AGO	1
4	Ethiopia	ETH	2
4	Nigeria	NGA	3
4	Mozambique	MOZ	4
4	Ghana	GHA	5
4	Tanzania	TZA	6
4	Democratic Republic of the Congo	COD	7
4	Zambia	ZMB	8
4	Uganda	UGA	9
4	Niger	NER	10

Individual AHP conducted across Risk variables

#	COUNTRY NAME	COUNTRY CODE	LOW RISK RANK
1	Mauritius	MUS	1
1	Cabo Verde	CPV	2
1	Tanzania	TZA	3
1	Sao Tome and Principe	STP	4
1	Seychelles	SYC	5
1	Gabon	GAB	6
1	Zambia	ZMB	7
1	Ghana	GHA	8
1	Rwanda	RWA	9
1	Uganda	UGA	10
2	Sao Tome and Principe	STP	1
2	Tanzania	TZA	2
2	Democratic Republic of the Congo	COD	3
2	Gabon	GAB	4
2	Cabo Verde	CPV	5
2	Nigeria	NGA	6
2	Cameroon	CMR	7
2	Liberia	LBR	8
2	Equatorial Guinea	GNQ	9
2	Ghana	GHA	10
3	Cabo Verde	CPV	1
3	Sao Tome and Principe	STP	2
3	Gabon	GAB	3
3	Democratic Republic of the Congo	COD	4
3	Tanzania	TZA	5
3	Equatorial Guinea	GNQ	6
3	Mauritius	MUS	7
3	Nigeria	NGA	8
3	Cameroon	CMR	9
3	Senegal	SEN	10
4	Tanzania	TZA	1
4	Cabo Verde	CPV	2
4	Nigeria	NGA	3
4	Sao Tome and Principe	STP	4
4	Mauritius	MUS	5
4	Ghana	GHA	6
4	Ivory Coast	CIV	7
4	Gabon	GAB	8
4	Uganda	UGA	9
4	Democratic Republic of the Congo	COD	10

Figure 7-7: AHP final outputs (ranking countries by opportunity and risk)

APPENDIX F: RISK ANALYSIS SOFTWARE SELECTION

		General information								Technical specification I								
Name	PRICE	Company name	Office location(s)	Product first released	Last stable version	Software license	License options	System Requirements	Spreadsheet used	Distribution fitting	Correlation fitting[18]	Time series fitting	Decision trees	Optimizer included	Database connectivity	VBA calls to functions[19]	C++ calls to functions[20]	Six Sigma supported
@RISK Industrial	35GBP = R600 for 1 year license	Palisade Corporation	Australia, Japan, UK, USA	1987	7.0.0	Proprietary	Single user, netw	Windows XP+	Excel 32-bit (Excel 2007+), Excel 64-b	Yes	Yes	Yes	Precisic	Yes	No	Yes	Yes	Yes
DiscoverSim + SigmaXL	30 day free trial	SigmaXL Inc.	Canada	2012	2.0	Proprietary	Single user	Windows Vista+	Excel 32-bit (Excel 2007+), Excel 64-b	Yes	Yes	No	No	Yes	No	No	No	Yes
MC FLO		Florentin Gonzalez Lopez	Switzerland	2016	Lumeares	Proprietary	Single user	Windows 2000+	Excel 32-bit (Excel 2010+), Excel 64-b	Yes	Yes	Yes	No	No	No	No	No	No
ModelRisk Industrial	installed on the computing network of an academic	Vose Software	Belgium, Russia, USA	2008	5.2.0.9	Proprietary	Single user, netw	Windows XP+	Excel 32-bit (Excel 2003+), Excel 64-b	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Risk Kit Suite	FREE	Wehrspohn GmbH & Co. KG	Germany	2007	6.0	Proprietary	Free, single user,	Windows 2000+	Excel 32-bit (Excel 2003+), Excel 64-b	Yes	Yes	Yes	No	No	No	Yes	Yes[21	No
SAFE TOOLBOXES		Safe Quantitative Technologies	USA	2016	1.0	Proprietary	Single user	Windows 2000+	Excel 32-bit (Excel 2003+), Excel 64-b	Yes	Yes	Yes	No	No	No	Yes	No	Yes
@RISK Standard	1000GBP	Palisade Corporation	Australia, Japan, UK, USA	1987	7.0.0	Proprietary	Single user, netw	Windows XP+	Excel 32-bit (Excel 2007+), Excel 64-b	No	Yes	No	Precisic	No	No	No	No	Yes
Crystal Ball	R5000 classroom edition	Oracle Corporation	USA	1987	11.1.4.4	Proprietary	Single user	Windows 2003+	Excel 32-bit (Excel 2003+), Excel 64-b	Yes	No	Yes	No	No	No	Yes	No	Yes
Crystal Ball + Decision Optimizer		Oracle Corporation	USA	1987	11.1.4.4	Proprietary	Single user	Windows 2003+	Excel 32-bit (Excel 2003+), Excel 64-b	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Quantum XL		Sigmazone	USA	2010	3.50.04	Proprietary	Single user	Windows XP+	Excel 32-bit (Excel 2000+), Excel 64-b	Yes	No	No	No	Yes	No	No	No	Yes
Risk Solver Pro		Frontline Systems	USA	2007	15.0	Proprietary	Single user, netw	Windows XP+	Excel 32-bit (Excel 2003+), Excel 64-b	Yes	No	XLMin	Yes	No	XLMin	Yes	Yes	Yes
Risk Solver Pro + Premium Solver Pro		Frontline Systems	USA	2007	15.0	Proprietary	Single user, netw	Windows XP+	Excel 32-bit (Excel 2003+), Excel 64-b	Yes	No	XLMin	Yes	Yes	XLMin	Yes	Yes	Yes
Ersatz		Epigear	Australia	2009	1.3	Proprietary	Single user	Windows 2000+	Excel 32-bit (Excel 2003+), Excel 64-b	No	No	No	No	Yes	No	No	No	No
Lumenaut		Lumenaut Ltd	Hong Kong	2003	3.6.5	Proprietary	Single user	Windows 2000+	Excel 32-bit (Excel 2003+), Excel 64-b	No	No	No	Yes	No	No	No	No	No
ModelRisk Standard		Vose Software	Belgium, Russia, USA	2008	5.2.0.9	Proprietary	Single user, netw	Windows XP+	Excel 32-bit (Excel 2003+), Excel 64-b	No	No	No	No	No	No	Yes	Yes	No
Risk Analyzer		Add-ins.com	USA	2003	11.02	Proprietary	Single user	Windows 2000+	Excel 32-bit (Excel 97+), Excel 64-bit	No	No	No	No	No	No	No	No	No
RiskAmp Personal		Structured Data LLC	USA	2005	11.5	Proprietary	Single user	Windows 2000+	Excel 32-bit (Excel 2003+), Excel 64-b	No	No	No	No	No	No	No	No	No
RiskAmp Professional		Structured Data LLC	USA	2005	11.5	Proprietary	Single user	Windows 2000+	Excel 32-bit (Excel 2003+), Excel 64-b	No	No	No	No	No	No	No	No	No
YASAI and YASAIw		Rutgers University and Washington State	USA	2001	2.4, 2.0w2	Freeware, Open so	N/A	Windows 95+	Excel 32-bit (Excel 97+), Excel 64-bit	No	No	No	No	No	No	Yes	No	No

	Technical specification II											Simulation Controls														
	Name	Converters for	Probability calculation functions[22]	UDF error analysis[23]	Extreme value modeling[24]	Expert elicitation tools[25]	Data previsualizer	ODE and numerical integration	Assumption library	Control of seed values	Maximum numbers of draws[26]	Random number generator	Lock / unlock random variables[27]	Multiple simulation runs[28]	Run macros before/after simulation[29]	Stop run when output generates error[30]	Apply specific sample in model[31]	Precision control[32]	Spreadsheet interpreter[33]	Sampling method[34]
	@RISK Industrial	Crystal Ba	Yes	No	No	Yes	Yes	No	Yes	Yes	Unlimited	Several	Yes	Yes	Yes	Yes	Yes	Yes	No	MC, LHS
	DiscoverSim + SigmaXL	No	Yes	No	No	No	Yes	No	No	Yes	10000000	Marsaglia KISS + Monster	No	No	No	No	No	No	Yes	MC, LHS
	MC.FLO	No	No	Yes	No	Yes	No	No	No	Yes	Constrained by Excel	Mersenne Twister	No	Yes	Yes	Yes	Yes	No	No	MC
	ModelRisk Industrial	Crystal Ba	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unlimited	Mersenne Twister	Yes	Yes	Yes	Yes	Yes	Yes	No	MC
	Risk Kit Suite	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Unlimited	Mersenne Twister	No	Yes	Yes	Yes	No	No	No	MC
	SAFE TOOLBOXES	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Unlimited	Mersenne Twister, RanLux	Yes	Yes	Yes	No	Yes	No	No	MC, Antithetic, Fauré,Halton
	@RISK Standard	Crystal Ba	Yes	No	No	Yes	Yes	No	No	Yes	Unlimited	Several	Yes	Yes	Yes	Yes	Yes	Yes	No	MC, LHS
	Crystal Ball	No	Yes	No	No	No	Yes	No	No	Yes	Unlimited	MCG[35]	Yes	Yes	Yes	Yes	No	Yes	Yes	MC, LHS
	Crystal Ball + Decision Optimizer	No	Yes	No	No	No	Yes	No	No	Yes	Unlimited	MCG[35]	Yes	Yes	Yes	Yes	No	Yes	Yes	MC, LHS
	Quantum XL	No	No	No	No	No	No	No	No	No	10000	Mersenne Twister	No	No	No	No	No	Yes	Yes	MC
	Risk Solver Pro	No	No	No	No	No	No	No	No	Yes	Unlimited	Several	Yes	Yes	Yes	No	Yes	No	Yes	MC, LHS, Sobol
	Risk Solver Pro + Premium Solver Pro	No	No	No	No	No	No	No	No	Yes	Unlimited	Several	Yes	Yes	Yes	No	Yes	No	Yes	MC, LHS, Sobol
	Ersatz	No	No	No	No	No	No	No	No	No	Unlimited	7 RNGs	Yes	Yes	Yes	No	No	No	No	MC
	Lumenaut	No	No	No	No	No	No	No	No	Yes	Constrained by Excel	Mersenne Twister	No	No	No	No	No	No	No	MC
	ModelRisk Standard	Crystal Ba	Yes	Yes	No	No	No	No	No	Yes	Unlimited	Mersenne Twister	Yes	Yes	Yes	Yes	Yes	Yes	No	MC
	Risk Analyzer	No	No	No	No	No	No	No	No	No	Constrained by Excel	?	No	No	No	No	No	No	No	MC
	RiskAmp Personal	No	No	No	No	No	No	No	No	Yes	Constrained by Excel	Mersenne Twister	Yes	No	No	No	No	No	No	MC, LHS
	RiskAmp Professional	No	No	No	No	No	No	No	No	Yes	Constrained by Excel	Mersenne Twister	Yes	No	No	No	No	No	No	MC, LHS
	YASAI and YASAIw	No	No	No	No	No	No	No	No	Yes	Constrained by Excel	L'Ecuyer's MRG32k3a[36]	No	Yes	Yes	No	No	No	No	MC

	Reporting results																Help file, support and training						
Name	Includes reporting tool	Free report viewer[37]	Save and retrieve results	Editing of graphs[38]	Histogram	Cumulative	Time series plot	Spider[39]	Tornado	Scatter	Pareto	Box	Statistics	Simulation data	Results filtering[40]	UDFs linked to help file[41]	Interfaces linked to help file[42]	Help file in PDF	Help file online	Technical support availabl	Language versions[43]	Online videos	Online training
@RISK Industrial	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	ZH, EN, F	Yes	Yes
DiscoverSim + SigmaXL	Yes	No	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Yes	EN	Yes	No
MC FLO	Yes	Not requir	Yes	Yes	Yes	Yes	N/A	N/A	Yes	N/A	N/A	N/A	Yes	Yes	Yes	No	No	Yes	No	Yes	DE, EN	Yes	No
ModelRisk Industrial	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	EN	Yes	Yes
Risk Kit Suite	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	No	Yes	EN, FR, D	Yes	No
SAFE TOOLBOXES	Yes	Not requir	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	EN	Yes	No
@RISK Standard	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	ZH, EN, F	Yes	Yes
Crystal Ball	Yes	Not requir	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	EN, JA, E	Yes	Yes
Crystal Ball + Decision Optimizer	Yes	Not requir	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	EN, JA, E	Yes	Yes
Quantum XL	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	No	No	Yes	EN	No	No
Risk Solver Pro	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	EN	Yes	Yes
Risk Solver Pro + Premium Solver	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	EN	Yes	Yes
Ersatz	No	No	Yes	Yes	Yes	No	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes	Yes	Yes	EN	No	No
Lumenaut	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	No	Yes	EN	No	No
ModelRisk Standard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	EN	Yes	Yes
Risk Analyzer	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	Yes	EN	No	?
RiskAmp Personal	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	Yes	Yes	Yes	EN	No	No
RiskAmp Professional	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No	Yes	Yes	Yes	EN	No	No
YASAI and YASAIw	No	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	No	No	No	No	No	EN	No	No

APPENDIX G: OUTPUTS OF MONTE CARLO SIMULATION

Orange Cells: TRIANGULAR DISTRIBUTION

	UNIT DEMAND (market size):			stdev:	529 150
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	1 000 000
Estimates:	3 000 000	2 200 000	2 000 000	CI at 90%:	502 511
X Stores:	10		2 426 495		

	SELL PRICE PER UNIT			stdev:	20,82
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	40,00
Estimates:	R 120,00	R 90,00	R 80,00	CI at 90%:	19,77
			R 93,34		

	OUTBOUND TRANS UNIT COST			stdev:	1,00
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	2,00
Estimates:	R 3,50	R 4,50	R 5,50	CI at 90%:	0,95
			R 3,87		

	INBOUND / IMPORT UNIT COST			stdev:	2,00
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	4,00
Estimates:	R 3,00	R 5,00	R 7,00	CI at 90%:	1,90
			R 5,07		

	ACTUAL UNIT COST			stdev:	12,58
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	25,00
Estimates:	R 55,00	R 65,00	R 80,00	CI at 90%:	11,95
			R 65,52		

	WHOUSING UNIT COST (OPEX)			stdev:	0,04
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	0,08
Estimates:	R 0,07	R 0,10	R 0,15	CI at 90%:	0,04
			R 0,12		

	CURRENT ASSETS			stdev:	3 307 189
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	6 250 000
Estimates:	R 500 000	R 5 500 000	R 6 750 000	CI at 90%:	3 140 694
			R 5 931 937		

	CAPEX FOR IN-COUNTRY DC			stdev:	6 557 439
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	13 000 000
Estimates:	R 75 000 000	R 80 000 000	R 88 000 000	CI at 90%:	6 227 315
			R 80 979 536		

	CAPEX FOR OPENING X STORES			stdev:	1 607 275
Range:	OPTIMISTIC	MOST LIKELY	PESSISMISTIC	range:	3 000 000
Estimates:	R 5 500 000	R 6 000 000	R 8 500 000	CI at 90%:	1 526 360
X Stores:	R 10		R 5 915 490		

Figure 7-8: Three inputs selected for each variable and the outputs of the Monte Carlo simulation in orange

	Demand (units)	Sellprice / unit	COGS / unit	Outbound Transport Cost	Inbound Transport Cost	Other Opex	Current Assets	Capex to open one Distribution Centre	Capex to open ten stores
Average	2 409 461	R 96,35	R 66,76	R 4,49	R 4,98	R 0,11	4 236 847	80 869 881	6 702 603
Standard Deviation	216 720	R 8,53	R 5,00	R 0,40	R 0,80	R 0,02	1 365 168	2 705 817	655 834
Variance	46 967 574 391	R 72,71	R 24,96	R 0,16	R 0,64	R 0,00	1 863 684 291 095	7 321 446 273 430	430 118 886 919
Skewness	162 759	R 6,32	R 2,81	R 0,15	R -	R 0,01	-	1 681 780	474 964
Kurtosis	266 439	R 10,52	R 6,23	R 0,50	R 0,99	R 0,02	1 701 098	3 390 410	806 428
Coefficient of Variation	0	R 0,09	R 0,07	R 0,09	R 0,16	R 0,15	0	0	0
Range	942 087	R 38,35	R 24,37	R 1,90	R 3,83	R 0,08	6 039 521	12 589 006	2 929 342
Range5_95	698 083	R 28,21	R 16,36	R 1,35	R 2,68	R 0,06	4 419 590	9 215 778	2 130 436
Minimum	2 021 273	R 80,34	R 55,47	R 3,55	R 3,14	R 0,07	625 386	75 136 686	5 514 987
Expected Tail <= 0,1%	2 024 102	R 80,61	R 55,59	R 3,56	R 3,17	R 0,07	662 795	75 178 961	5 536 317
0,01% - Quantile	2 021 273	R 80,34	R 55,47	R 3,55	R 3,14	R 0,07	625 386	75 136 686	5 514 987
0,1% - Quantile	2 026 930	R 80,88	R 55,70	R 3,58	R 3,20	R 0,07	700 205	75 221 236	5 557 648
1% - Quantile	2 043 139	R 81,54	R 56,72	R 3,63	R 3,29	R 0,08	999 042	75 667 019	5 604 015
2% - Quantile	2 063 619	R 82,64	R 57,50	R 3,70	R 3,41	R 0,08	1 219 819	75 937 176	5 650 771
3% - Quantile	2 079 526	R 83,41	R 58,02	R 3,77	R 3,48	R 0,08	1 423 529	76 179 938	5 693 351
4% - Quantile	2 093 539	R 83,68	R 58,54	R 3,78	R 3,53	R 0,08	1 566 034	76 348 339	5 726 320
5% - Quantile	2 106 463	R 83,88	R 58,90	R 3,81	R 3,61	R 0,08	1 668 916	76 516 675	5 752 775
10% - Quantile	2 149 724	R 85,90	R 60,14	R 3,97	R 3,89	R 0,09	2 151 374	77 432 777	5 895 095
80% - Quantile	2 612 839	R 104,70	R 71,13	R 4,85	R 5,72	R 0,12	5 472 142	83 171 255	7 327 965
90% - Quantile	2 730 316	R 108,77	R 73,71	R 5,04	R 6,05	R 0,13	5 806 356	84 758 145	7 644 482
95% - Quantile	2 804 546	R 112,10	R 75,25	R 5,16	R 6,29	R 0,14	6 088 506	85 732 452	7 883 211
99% - Quantile	2 894 507	R 115,47	R 77,83	R 5,34	R 6,63	R 0,14	6 486 855	86 747 883	8 180 546
99,9% - Quantile	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329
99,99% - Quantile	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329
Expected Tail >= 99,9%	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329
Maximum	2 963 360	R 118,69	R 79,84	R 5,45	R 6,97	R 0,15	6 664 906	87 725 692	8 444 329

Figure 7-9: Final iteration of Monte Carlo simulation (with 1000 runs)

APPENDIX H: OUTPUTS OF SENSITIVITY ANALYSIS

Appendix H contains all the outputs from the what-if and sensitivity analyses conducted on the strategic profit model's input variables.

The first three tables displayed show the impact of unit demand and sell price on the total sales, cost of goods sold and gross margin.

Table 7-11: What-if analysis on sales: total unit demand vs sell price

WHAT-IF ON SALES: unit demand vs sell price

			unit demand				
			2 000 000	2 100 000	2 200 000	2 600 000	3 000 000
sell price	R	80,00	R 160 000 000	R 168 000 000	R 176 000 000	R 208 000 000	R 240 000 000
	R	85,00	R 170 000 000	R 178 500 000	R 187 000 000	R 221 000 000	R 255 000 000
	R	90,00	R 180 000 000	R 189 000 000	R 198 000 000	R 234 000 000	R 270 000 000
	R	105,00	R 210 000 000	R 220 500 000	R 231 000 000	R 273 000 000	R 315 000 000
	R	120,00	R 240 000 000	R 252 000 000	R 264 000 000	R 312 000 000	R 360 000 000

Table 7-12: What-if analysis on cost of goods sold: cost per unit vs total unit demand

WHAT-IF ON COGS: cogs per units vs unit demand

		cogs/unit				
		R 55	R 60	R 65	R 73	R 80
unit demand	2 000 000	110 000 000	120 000 000	130 000 000	145 000 000	160 000 000
	2 100 000	115 500 000	126 000 000	136 500 000	152 250 000	168 000 000
	2 200 000	121 000 000	132 000 000	143 000 000	159 500 000	176 000 000
	2 600 000	143 000 000	156 000 000	169 000 000	188 500 000	208 000 000
	3 000 000	165 000 000	180 000 000	195 000 000	217 500 000	240 000 000

Table 7-13: What-if analysis on gross margin: total sales vs cost of goods sold

WHAT-IF ON GROSS MARGIN: sales vs cogs

		sales				
		R 160 000 000	R 210 000 000	R 260 000 000	R 310 000 000	R 360 000 000
cogs	R 110 000 000	50 000 000	100 000 000	150 000 000	200 000 000	250 000 000
	R 142 500 000	17 500 000	67 500 000	117 500 000	167 500 000	217 500 000
	R 175 000 000	- 15 000 000	35 000 000	85 000 000	135 000 000	185 000 000
	R 207 500 000	- 47 500 000	2 500 000	52 500 000	102 500 000	152 500 000
	R 240 000 000	- 80 000 000	- 30 000 000	20 000 000	70 000 000	120 000 000

Results from the sensitivity analysis conducted on the Monte Carlo variables below:

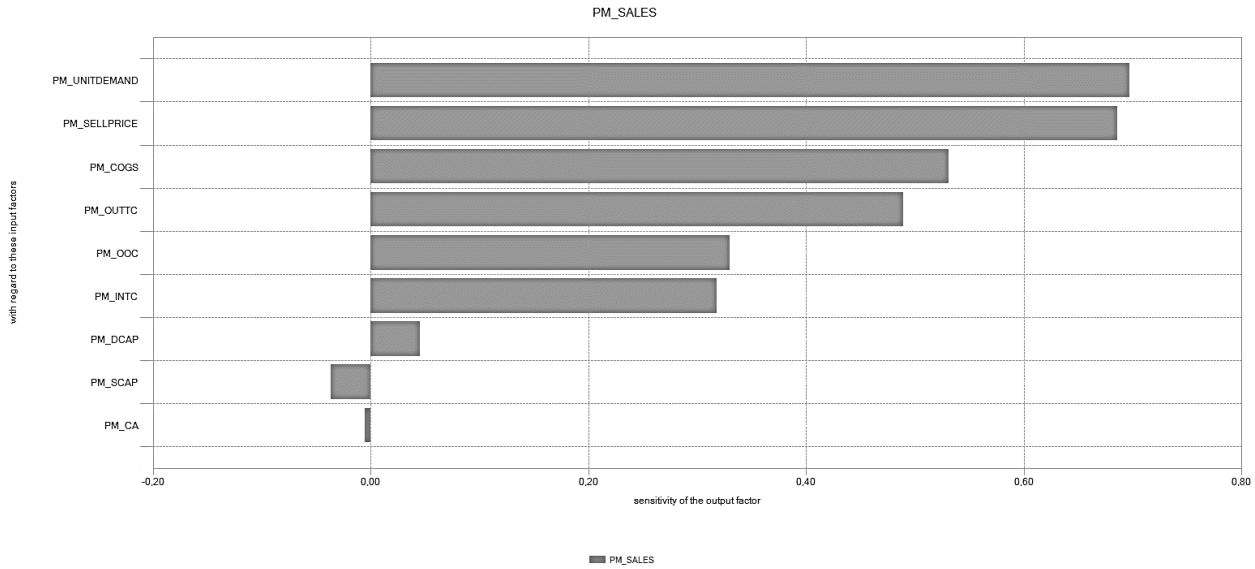
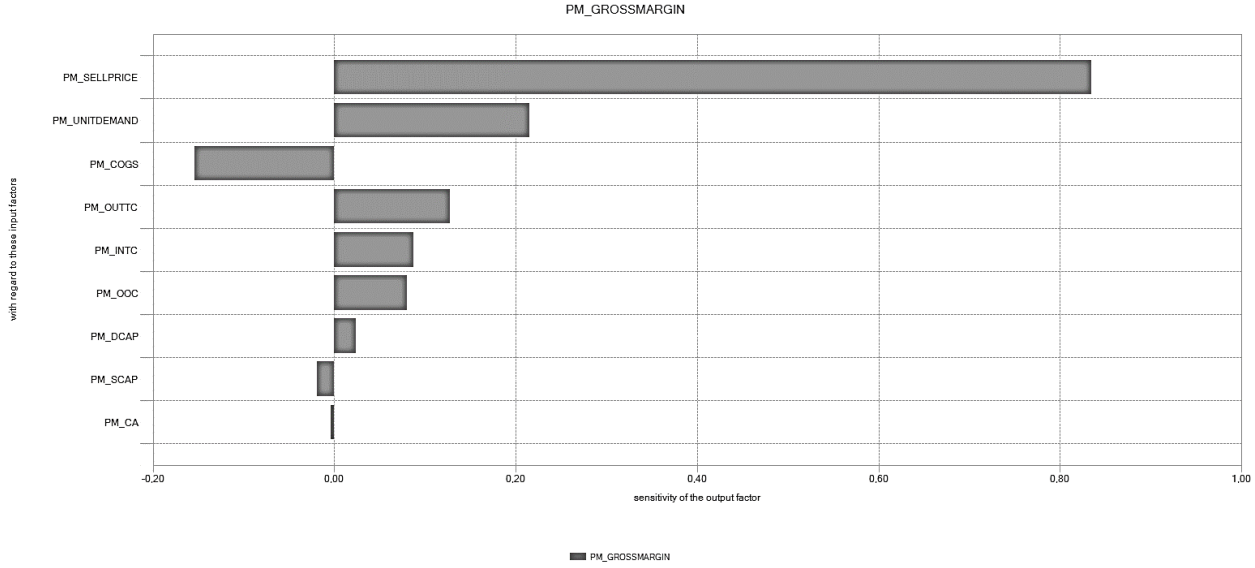


Figure 7-10: Linear sensitivity analysis on sales variable



Impact of variables on the net income and profit margin:

WHAT-IF ON TOTAL OPERATING COST: inbound & outbound transport costs vs unit demand

unit demand	inbound & outbound transport cost per unit				
	R 6,50	R 8,00	R 9,50	R 11,00	R 12,50
2 000 000	R 13 245 830	R 16 245 830	R 19 245 830	R 22 245 830	R 25 245 830
2 100 000	R 13 895 830	R 17 045 830	R 20 195 830	R 23 345 830	R 26 495 830
2 200 000	R 14 545 830	R 17 845 830	R 21 145 830	R 24 445 830	R 27 745 830
2 600 000	R 17 145 830	R 21 045 830	R 24 945 830	R 28 845 830	R 32 745 830
3 000 000	R 19 745 830	R 24 245 830	R 28 745 830	R 33 245 830	R 37 745 830

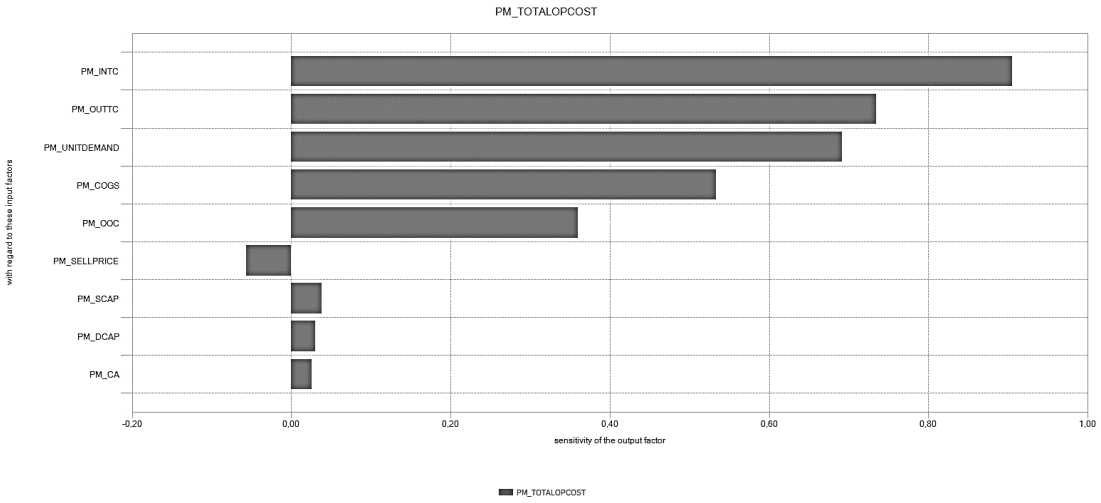
WHAT-IF ON NET INCOME: gross margin vs total operating cost

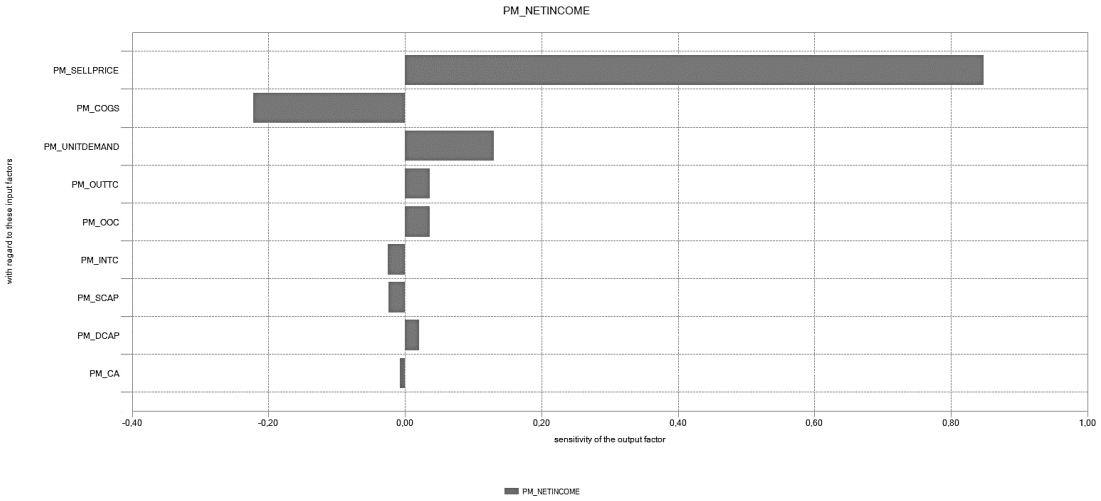
		gross margin				
		2 500 000	26 875 000	51 250 000	75 625 000	100 000 000
total op cost	13 000 000	R -10 500 000	R 13 875 000	R 38 250 000	R 62 625 000	R 87 000 000
	19 250 000	R -16 750 000	R 7 625 000	R 32 000 000	R 56 375 000	R 80 750 000
	25 500 000	R -23 000 000	R 1 375 000	R 25 750 000	R 50 125 000	R 74 500 000
	31 750 000	R -29 250 000	R -4 875 000	R 19 500 000	R 43 875 000	R 68 250 000
	38 000 000	R -35 500 000	R -11 125 000	R 13 250 000	R 37 625 000	R 62 000 000

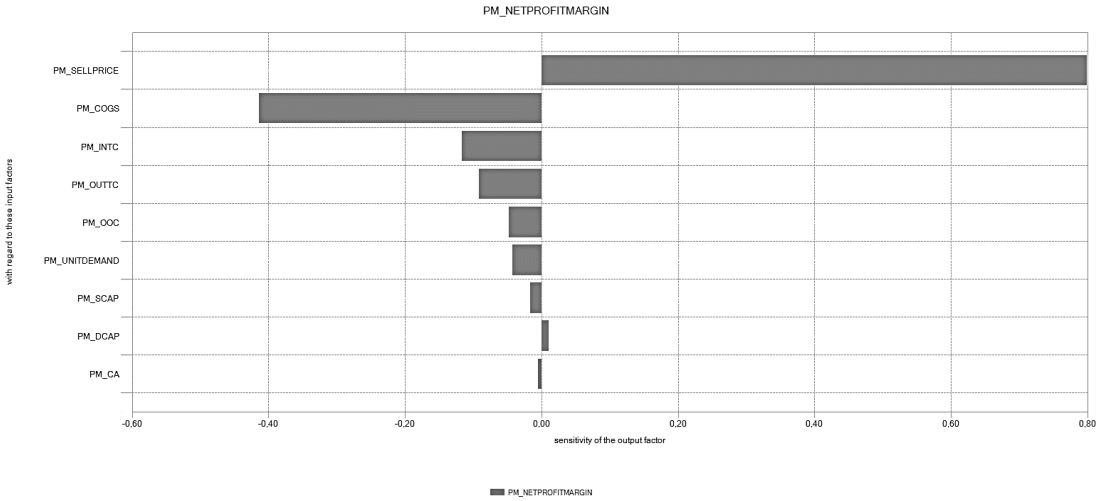
WHAT-IF ON NET PROFIT MARGIN: sales vs net income

		sales				
		R 160 000 000	R 210 000 000	R 260 000 000	R 310 000 000	R 360 000 000
net income	R 1 000 000	1%	0%	0%	0%	0%
	R 22 500 000	14%	11%	9%	7%	6%
	R 44 000 000	28%	21%	17%	14%	12%
	R 65 500 000	41%	31%	25%	21%	18%
	R 87 000 000	54%	41%	33%	28%	24%

For the purposes of this investigation, gross margin is considered to be the benefit of the market expansion decision, with the total operational cost considered as the final cost parameter.







Impact of variables on the return on assets:

WHAT-IF ON RETURN ON ASSETS: total assests vs net income

		total assets				
		R 60 000 000	R 80 000 000	R 100 000 000	R 120 000 000	R 140 000 000
net income	R 1 000 000	2%	1%	1%	1%	1%
	R 22 500 000	38%	28%	23%	19%	16%
	R 44 000 000	73%	55%	44%	37%	31%
	R 65 500 000	109%	82%	66%	55%	47%
	R 87 000 000	145%	109%	87%	73%	62%